Effects-Based Targeting
Another Empty Promise?

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Abstract

What is effects-based targeting and from where did this concept come? Is it based on a coherent theory; and, if so, has the USAF incorporated it into its doctrine and operations? Is there more yet to do? These questions form both the focus and format of this study, which examines the evolution of effects-based targeting. Specifically, this study asks how effectively has the USAF incorporated the concept of effects-based operations into its procedures for targeting and combat assessment.

To answer this question, the study defines effects-based targeting, asserting that commanders should direct airpower against targets in ways that produce specific, predetermined, military, and political effects. This study explores the historical development of effects-based targeting theory and then conducts a focused comparison of four major air operations—Pointblank, Linebacker II, Desert Storm, and Allied Force—in order to survey US airpower's actual combat experience with regard to effects-based operations.

This study determines that senior decision makers have always been interested in creating specific effects rather than simply destroying targets; however, as a whole, the USAF has been inconsistent in employing effects-based operations across the spectrum of conflict.

American airpower has accomplished its most significant improvements at the tactical level of war but is less reliable in creating operational and strategic effects. In a similar vein, airpower has become very effective at producing direct physical effects; and it is becoming increasingly capable of creating certain widespread systemic effects. Generally, though, the ability to even predict—much less generate—specific psychological effects remains yet a hope and may, in fact, act as a virtual ceiling on the potential of effects-based operations.

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About the Author

Maj T. W. Beagle Jr. is a B-1 pilot. After graduating from the US Air Force Academy in 1986, he attended undergraduate pilot training at Columbus Air Force Base (AFB), Mississippi, before beginning his first operational flying tour in the B-52H at Carswell AFB, Texas, in early 1988. After four and one-half years of nuclear alert, he cross-trained into the B-1 and transferred to Ellsworth AFB, South Dakota, for the next five and one-half years. While there, Major Beagle upgraded to instructor pilot and served as chief of Squadron Standardization and Evaluation. An outstanding graduate of the USAF weapons school, he served in the capacity of wing weapons officer for a year before returning to the school as an instructor and flight commander. A senior pilot with more than 3,000 hours of flying time, Major Beagle completed Air Command and Staff College at Maxwell AFB, Alabama in June 1999 and remained there to attend the School of Advanced Airpower Studies the following year. Upon graduation, he was assigned to the Air Staff's Checkmate Division in Washington, D.C. A 1992 distinguished graduate of Squadron Officer School, he also holds a master's degree in aeronautical science from Embry–Riddle Aeronautical University. He is married to the former Bunny Kay Patterson, and they have five children: Alyssa, Zachary, April, Isaac, and Eric.

Acknowledgments

As in all things, I thank Jesus Christ, my Savior, for bringing me to this point and seeing me through the trying year it took to create this study. I also truly appreciate the tireless efforts of my advisor, Lt Col Forrest Morgan, whose patience, guidance, and wisdom taught me much. His diligence and high standards improved the quality of this study immeasurably. Any mistakes or shortcomings that remain, I jealously claim as my own.

My gratitude also extends to those who have served this country in uniform and have been willing to leave loved ones in order to do their nation's bidding. This research only served to heighten my appreciation of their courage, professionalism, struggles, and sacrifices. With particular regard to this study, I thank those who not only served in Operation Allied Force but then willingly took time from their busy lives to graciously respond to the countless E-mails with which I bombarded them.

Finally, however, my greatest debt of thanks goes to my family for giving of their husband and father. My children (Alyssa, Zach, April, Isaac, and Eric) heard "not now, Daddy's working on school" far more than any children should. I thank God for my family, and I thank my family for their patience and love.

Chapter 1

Introduction

The evaluation of the effects of aerial bombardment operations . . . has been raised to first importance by the maturing of air power in the present conflict. No established methodology has been evolved, however, for making such an evaluation; in fact the exact nature and scope of the problem itself . . . are not generally understood. Assuming adequate force employed, the ability . . . to accomplish the physical destruction of targets . . . has been demonstrated. The effects, however, of such destruction on the course and duration of the war, are not readily apparent. Those effects are numerous and complex, and range from tangible ones capable of more or less precise measurement to highly imponderable ones incapable of such measurement. The relative importance of the various effects may have no relationship to the degree of tangibility present in each. . . . For example . . . [t]he evaluation of the state of enemy morale at any given time belongs in the category of factors which make the conduct of war an art as well as a science.

—Response to a Chief of Staff tasking
15 September 1943

Following the success of Operation Desert Storm, stories began filtering out that spoke of a new type of war—parallel war—with action to induce specific effects as its foundation. Col David A. Deptula, "Black Hole" planner for Gen H. Norman Schwarzkopf, wrote, "The solution [to operations in a constrained environment] lay in effects-based rather than destruction-based targeting."[1] Then, in October of 1999, the concept of effects-based operations began to appear in print once again following the "success" of Operation Allied Force in Kosovo. In the words of the commander of US Air Forces in Europe, Gen John P. Jumper, "Effects-based targeting has to be the objective of the air campaign planners, as opposed to campaign by target-list management."[2]

Why is this concept called effects-based targeting, and from where did it come? Is it based on a coherent theory and, if so, has the USAF incorporated it in its doctrine and operations? Is there more yet to do? These questions form both the focus and format of this study, which seeks to examine the evolution of effects-based targeting. Specifically, this study asks how effectively has the USAF incorporated the concept of effects-based operations into its procedures for targeting and combat assessment.

To answer this question, the study begins in chapter 2 by defining effects-based targeting, asserting that commanders should direct airpower against targets in ways that produce specific, predetermined military and political effects. The chapter discusses several taxonomies for classifying these effects and presents a conceptual framework that airpower profes-

sionals can use to plan, execute, assess, and incorporate feedback in an iterative fashion as they employ a dynamic effects-based strategy.

Chapter 3 explores the historical development of effects-based targeting theory as revealed in the writings of prominent theorists and military planners. These sources provide a rich body of war-fighting theory that focuses on manipulating effects to achieve military and political objectives. The theories suggest these men considered the act of destroying physical targets to be a means of achieving a higher-order effect, not an end in itself. Following this look at theory, the study focuses on practice.

Chapters 4 through 7 review four major air operations in order to survey US airpower's actual combat experience with regard to effects-based operations. First, the Combined Bomber Offensive (CBO) of World War II is arguably one of the earliest major aerial bombardment campaigns. In 1943 Allied leaders began combat-testing a variety of airpower employment theories, and few survived unscathed. Second, chapter 5 examines Operation Linebacker II. This operation occurred late in the Vietnam War and was the first major effort in which US airpower employed laser-guided bombs. Third, chapter 6 examines the air portion of Desert Storm, which employed a mature air capability with significantly improved precision munitions and equally enhanced intelligence capabilities. Fourth, this study focuses on Operation Allied Force. In this case, political constraints denied air commanders the opportunity to employ airpower in a way they would have preferred; yet, this recent example enables us to examine some of the USAF's most current combat practices.

Readers may observe that this study concentrates on large-scale conventional conflict in which American airpower played a significant role. Due to time and space constraints, air operations in the Korean War, Bosnia, and numerous smaller contingencies are not included. As a result, effects-based operations in small-scale contingencies and operations other than war are not explored. Nevertheless, many of this study's lessons may still be applied to such operations.

For comparative purposes, each of the four case studies employs the same analytical framework. Each begins with a historical description of the overall conflict to establish context before narrowing to the specific operation in question. This description reviews the objectives—from the national and strategic levels down to the supporting air objectives—that guided actions within each operation. With the stage set for what US airpower strategists intended to achieve, analysis begins by evaluating case events in terms of a four-step iterative loop that characterizes sound effects-based operations. This study also examines targeting debates, combat plans, and air operations to determine how airpower practitioners envisioned effects-based operations and how well they carried them out.

The first step of the iterative loop explores whether planners emphasized higher-order effects and considered how they would measure those effects as they constructed their air operations. The second step examines the execution and determines whether operators could actually carry out

the plan as initially conceived. Third, there should have been some assessment of results—if so, how did analysts perform this assessment, and to what degree was it successful in terms of timeliness, accuracy, and usefulness? The fourth step examines feedback and replanning functions to ascertain what changes took place as a result of these findings. How did planners incorporate assessment results back into the planning process, and how did the results influence subsequent operations? We apply this four-step analysis in historical context—what were the planners and decision makers thinking, and what did they have available to them at the time—but hindsight, with its greater acuity, frequently reveals new evidence and fresh insights that place case events in a different perspective.

Given this improved awareness, each case study seeks to determine what we can learn from the *actual* results given the perspective of time. What effects or results became known "after the fact" from information not available when conversations and decisions actually took place? This retrospective look—combined with the real-time appraisal—completes the analysis of each operation, and each chapter concludes with a brief interim summary before transitioning to the next case study.

The four cases provide ample evidence of the development and, in some cases, stagnation of effects-based practices. From this history, chapter 8 appraises the current state of USAF effects-based operations. Ultimately, this study concludes that (1) senior decision makers have always been interested in creating specific effects rather than simply destroying targets; however, as a whole, the USAF has been inconsistent in employing effects-based operations across the spectrum of conflict; (2) American airpower's most significant effects-related improvements have focused on the tactical level of war with considerably less progress evident at the operational and strategic levels; and (3) airpower has become very effective at producing direct, physical effects and is becoming increasingly capable of creating certain widespread systemic effects. However, the most sought-after effects are often psychological in nature, and efforts to improve airpower's capabilities in this area are virtually nonexistent. This study discusses the implications of these trends and closes by addressing areas needing improvement if we are to remain not only competitive but also dominant in combat. This study does not seek to discover the Holy Grail of targets or target sets. Rather, it simply seeks to examine the historical feasibility of an effects-based process within conventional air operations.

Notes

1. Col David A. Deptula, "Firing for Effect: Change in the Nature of Warfare," *Defense and Airpower Series* (Arlington, Va.: Aerospace Education Foundation, 24 August 1995), 4.
2. James A. Kitfield, "Another Look at the Air War That Was," *Air Force Magazine*, October 1999, 42.

Chapter 2

Effects-Based Targeting: What Is It?

The focus at a given level of war is not on the specific weapons used, or even on the targets attacked, but rather on the desired effects.

> —Air Force Doctrine Document 2
> *Organization and Employment of Aerospace Power*

Instead of relying on massed forces and sequential ops, we will achieve massed effects in other ways.

> —*Joint Vision 2010*

Many of the ideas and concepts in this section originated in draft documents currently in work under a collaborative effort by the USAF Doctrine Center, the College of Aerospace Doctrine, Research and Education (CADRE), and Headquarters USAF/XOCI.

Simply put, effects-based targeting is identifying and engaging an adversary's key capabilities in the most efficient manner to produce a specific effect consistent with the commander's objectives.[1] The underlying concept, therefore, posits it is possible to direct airpower against targets in ways that cause military and political effects beyond the mere destruction of those targets. Airpower may still seek to destroy targets, but destruction is only one effect within a spectrum of desired options. More typically, it is a first step en route to more subsequent highly desired effects. Consequently, effects-based targeting adherents view destruction primarily as a means and rarely as an end in itself. The aim of effects-based operations lies in using target destruction (or some other effect via nonlethal technology) to generate predetermined second-order effects at the operational and strategic levels of war, which—in turn—compels enemy decision makers to respond in ways favorable to our overall campaign objectives. The net result suggests airpower can be applied more economically and with greater coercive effect—goals ever important in times of fiscal and material constraint.

Definitions and Taxonomies

The term *effects* is extremely nebulous. Because of this, we need to consider several taxonomies in order to focus future discussions. The simplest is that of direct or indirect.[2] A direct effect is the result of actions with no intervening effect or mechanism between act and outcome. These effects are usually immediate and easily recognizable. Conversely, an indirect effect is a result created through an intermediate effect or mechanism

to produce the final outcome, which may be physical or psychological in nature. Indirect effects tend to be delayed and may be difficult to recognize. One can see the relationship of direct and indirect effects in a plan that targets enemy oil refineries. Destroying a single refinery creates a direct effect that a specific refinery ceases to operate. However—if several refineries are destroyed—then the planners' true objective, the indirect effect, may begin to be realized. The enemy's mechanized forces become immobilized due to lack of fuel. However, if the plan succeeds, it will require some period of time before enemy fuel consumption depletes available reserves. During this time, the effects may be difficult to recognize. Figure 1 depicts the interaction of direct and indirect effects, as well as the ability to achieve a single objective via multiple means.[3]
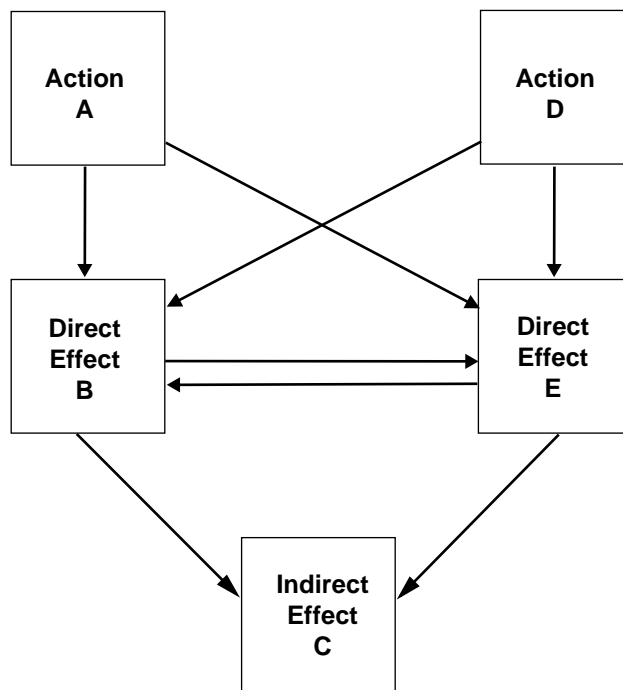
Source: USAF Doctrine Center briefing, "Strategic and Indirect Effects: Defining and Modeling."

Figure 1. Interaction of Direct and Indirect Effects

Categorizing effects as direct or indirect further suggests a numerical taxonomy based on the order in which those effects occur. Thus, a first-order effect is synonymous with a direct effect and subsequent orders (second, third, fourth, etc.) are the first, second, third, and so on layers of indirect effects.[4] As one might expect, it becomes increasingly difficult to predict the outcomes of successively higher-order effects. Due to the tenuous nature of predicting causal linkages between higher-order effects, this taxonomy is only useful in discussing first-, second-, and, possibly, third-order effects. Fortunately, there are other considerations besides simply the order in which effects occur.

Anything that can be influenced will have effects associated with that influence. One can classify those effects by associating them with the target area—or medium being influenced—that is, logistical, leadership, infrastructure, cyber, space, security, mobility, political, and so forth. While this method of classification may be useful at lower levels of analysis, it becomes ponderous at higher levels of discussion. A more general method of grouping effects is to categorize them as physical, systemic, and psychological.[5] The primary purpose of a physical effect is to eliminate or neutralize the object targeted. Historically, targeteers achieved this effect through destruction; however, with the advent of nonlethal technology, other means may soon be available. Systemic effects are those aimed at disrupting the functions of a specific system or systems—for example, an electrical power grid. Lastly, psychological effects occur in the adversary's mind and require an indirect approach as there is no material basis to target directly.[6]

Another practical and historically popular method of grouping effects is via the war-related function at which they aim—that is, the enemy's war-making capability, war-sustaining capacity, or his will to fight. War making describes the actual troops, equipment, and capabilities through which the enemy exerts his combat power. War sustainment refers to the enemy's ability to maintain and support his war efforts through production, distribution, and supply. Lastly, the enemy's *will* expresses his commitment to the war and his resolve to persevere in pursuit of his wartime objectives. Of course, this last category—the adversary's war-fighting will—is the least tangible of the three and being akin to psychological effects can only be attacked indirectly.

A third scheme for grouping functional effects looks at the enemy as a whole via his social structure and national instruments of power. Thinking in these terms—military, political, economic, and social—necessarily broadens the scope of consideration and may expose weaknesses more vulnerable to coercive leverage than a more direct (and costly) force-on-force approach.[7] Exploiting these vulnerabilities may enable us to attain our ultimate political objectives with greater economy of force. This third taxonomy, by expanding the focus, hints at a final means of categorization.

A completely different taxonomy associates the desired effects with the most applicable level of war—tactical, operational, or strategic—at which they are directed. The *tactical* level of war is associated directly with the battlefield engagement at the unit level—and below—and narrowly focuses on maneuvering combat elements in direct achievement of combat objectives.[8] Effects at this level contribute to reducing the enemy's war-making capability on a relatively localized scale. Thus, tactical effects are typically immediate but limited in duration and scope of influence. The *operational* level concerns planning, conducting, and sustaining campaigns and major operations within a theater.[9] The qualities of effects at this level describe the middle ground between those of the tactical and strategic levels of war in terms of time required for manifestation, duration,

and scope of influence. Finally, the *strategic* level views the war as a whole by addressing a nation's military and security objectives. Strategic effects aim at disrupting the enemy's strategy, ability, or will to wage war by destroying or disrupting his vital centers—which may entail military, political, economic, or social ramifications. Strategic effects generally do not occur immediately and can actually be quite slow in their manifestation; however, once manifest, they typically have a significantly larger span of influence and subsequent duration than do lower-level effects.[10]

Interim Summary

Figure 2 encapsulates the primary taxonomies just discussed but should serve only as a general guide to stimulate thought. It is not a checklist. Additionally, though each of these taxonomies is useful within specific contexts, attempting to use them all becomes unwieldy and potentially confusing. Thus, not only for the sake of simplicity but also because this taxonomy most closely matches that currently used by the USAF, this study is limited to examining physical, systemic, and psychological effects at the various levels of war.[11]

Tactical Level of War		Operational Level of War		Strategic Level of War	
War making		War sustaining		Will to Fight	
Physical		Systemic		Psychological	
Military		Economic	Social		Political

Figure 2. Effects Taxonomies

Note: While it is tempting to view this matrix vertically and infer relationships between the various classifications, such conclusions dangerously gloss over relationships between categories and ignore other characteristics, such as cumulative, cascading, and distributive properties of effects.

Other Qualities of Effects

Besides being direct or indirect, effects have other qualities planners must consider. As noted earlier, effects vary in the time required for them to mature and become manifest, as well as in their duration and the scope of their influence. While some effects take place instantly, others take longer to manifest themselves due to the complex chain of events set in motion when interrelated target systems are attacked. As a result, effects may have cumulative, cascading, or distributive properties.

Cumulative effects result when direct or indirect effects aggregate and may occur at the same or different levels of war as their contributing lower-order effects. This is seen, for instance, when destroying numerous surface-to-air missile (SAM) sites at the tactical level results in increased operational-level air superiority. Moreover, effects often cascade as indirect effects that ripple through an enemy system, influencing other systems

en route. Typically, these effects occur when an attack affects nodes critical to multiple systems and, most often, they flow from higher to lower levels within the enemy's system. For example, destroying an enemy's central headquarters may cause effects to cascade down through several echelons and ultimately disrupt numerous tactical units on the battlefield.[12] The cumulative and cascading nature of effects contribute to their distributive character.

The distributive nature of these phenomena suggests that virtually no part of the enemy is truly isolated, and any effects generated emanate outwards affecting other systems and subsystems.[13] This characteristic more than any other drives home the point that even though the previously discussed taxonomies are necessary to facilitate discussion and study, they are in the end completely arbitrary with few, if any, clear lines of demarcation. The result is that planned first-order effects may generate subsequent effects that were unintended and even completely unanticipated. This reality highlights the complexity of higher-order effects and recalls their description in this study's opening epigraph as "highly imponderable." Figure 3 shows the increasing complexity involved with predicting higher-order effects within a complex and interrelated system such as an enemy nation.[14]
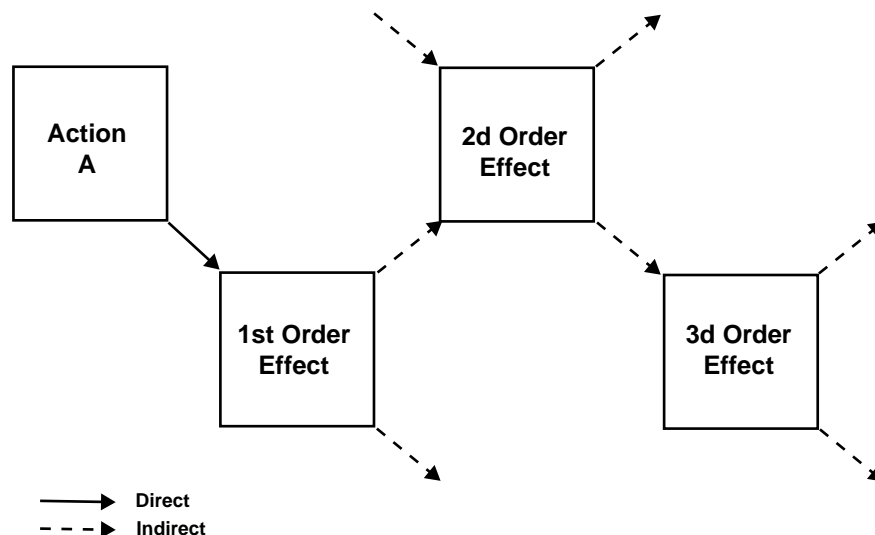
Figure 3. Complexity of Higher-Order Effects

To briefly summarize with an illustration, it is thus possible to conduct a first-order physical action (e.g., destruction of an electrical switching station) that directly produces systemic effects (loss of power within a given region that happens to include a petroleum, oil, and lubricants [POL] processing plant). That, in turn, eventually causes local enemy aircraft to be

grounded for lack of fuel. This is good, as air superiority is achieved without a potentially expensive force-on-force confrontation. Unfortunately, the region's only water purification plant also unexpectedly loses electrical power; and word of the pain and suffering inflicted on innocent civilians reaches the media, resulting in severe oversight and involvement in previously independent targeting decisions.[15] Having enhanced our knowledge of effects and some of their attendant problems, let us return to the broader concept of "effects-based operations" and examine their execution.

A Conceptual Framework for Effects-Based Planning

Joint publications state, "Objectives provide the focus for military action; they are essential for unity of effort. In the abstract sense, the objective is the effect desired."[16] The question then is from where do these objectives come. Conceptually, unified efforts are derived from a coherent plan, which links national objectives to all subsequent military actions. This hierarchical arrangement can be depicted as a "Z-diagram" describing the congruent linkages between objectives and strategy at each level of planning (see fig. 4).[17] Effects-based operations provide the ideal means to execute this strategy-to-task framework because it forces planners to consciously link efforts with objectives and lower-level objectives with higher ones. Planners and decision makers at every level must ask what the desired end state is before they can proceed to plan a strategy or course of action to create that outcome. Importantly, the higher the level at which end states and objectives are clearly stated, the more likely that supporting objectives and strategies will be congruent and effective and the more likely that we will attain our ultimate political objectives.

National Security Objectives → National Security Strategy — Who decides? NCA and JCS

National Military Objectives ↔ National Military Strategy — CINC / JFC

Theater Objectives ↔ Theater Strategy — JCFACC

Air Objectives ↔ Air Strategy

Legend:
CINC—commander in chief
JCFACC—joint combined forces air component commander
JCS—Joint Chiefs of Staff
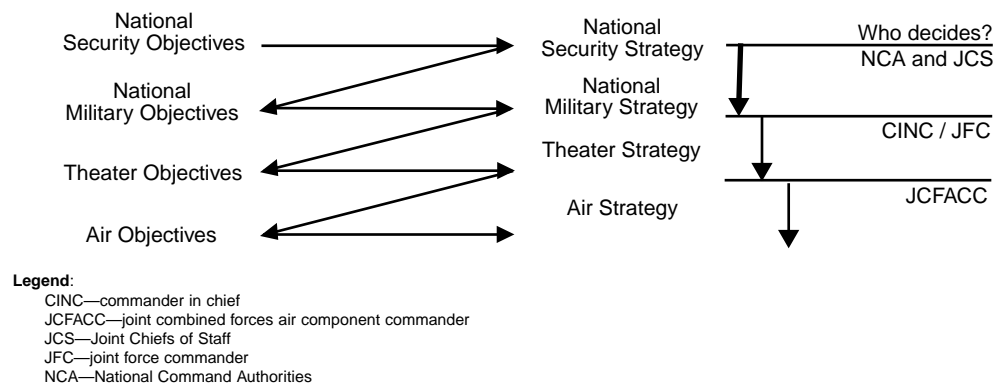JFC—joint force commander
NCA—National Command Authorities

Figure 4. Z-Diagram

An effects-based operation is less a specific procedure than a strategy-to-task mind-set focused on evaluating the achievement of desired effects rather than the destruction of specific targets.[18] It serves to focus diversified

efforts towards a common objective. The key is assessing effectiveness at all levels, and the true value lies in continually assessing and analyzing the current strategy's success in achieving the commander in chief's (CINC) intent.[19] This, in theory, should then support the achievement of national objectives.

The key in assessing effects is a skeptical "so what?" mentality. A simple tally of sorties launched and weapons delivered does not count towards mission success. Every strike prompts a series of questions such as, was the target hit? If so, did hitting the target achieve the desired effects and, if so, did the desired effects meet the stated objective? The result of each strike mission initiates a collection-assessment-feedback loop that occurs repeatedly throughout a campaign's planning and execution process. Strike results prompt another "so what," which—in turn—helps determine whether retasking, retargeting, or replanning is in order.[20] If the same target needs to be struck again, either through the same or different means, then retasking is necessary; if a different target is required in order to achieve the desired effect, then retargeting is in order; and if the desired effect was not achieved within the expected timeframe or it was achieved, but failed to accomplish the stated objective, then replanning is mandated. Through all of this, the achievement of desired effects, not target status, determines subsequent efforts.

If the key in assessing effects is a so-what mentality, then there must exist information or intelligence to which this query can be applied. Thus arises the question of measurability. It is not enough simply to decide upon a desired effect or even to predict follow-on secondary and tertiary effects. Though both of these steps are necessary, neither is sufficient. The crux of assessment is having selected information to evaluate concerning the consequences of actions taken in order to determine the rate and direction of your strategy's progress. Once you act and set the consequent effects in motion, you must be able to measure those effects. Three levels deserve consideration—assessment of delivery results, subsequent order effects, and strategy effectiveness.[21] The first level of assessment determines the current status of the target after weapons delivery. This captures the first-order physical effect upon the target. The second level must capture the resultant indirect effects, a task much more difficult as those effects may be functional, systemic, or even psychological. Direct measurability becomes problematic as effects move along this spectrum from physical to systemic to psychological with a corresponding decrease in their material basis. This shift requires measurements more sophisticated than simply interpreting imagery. Third, one must assess each effect's contribution to the stated objective. At this point, the focus changes from effects to effectiveness, from "Did we do the action correctly?" to "Did we do the correct action?"[22] This step is even less quantifiable than previous ones. However, assuming completion of the assessment, analysts then feed the information back so that, if replanning, retargeting, or retasking is required, planners can adapt the strategy

proactively. Obviously, the key is assessment and, given the difficulties involved, the time to consider that function is not after the strike has taken place, but before.

As essential as the execution, collection, assessment, and feedback steps are, much of the success of effects-based operations is determined during the planning phase before any aircraft leaves the ground. Planners need to address all issues of collection and assessment beforehand so that collection assets are in place at the proper time and assessment analysts know exactly for what they are searching. These issues can be ameliorated, if not eliminated, if the planning process culminates with a series of tasks and associated measures of merit. Each task specifies the desired effect along with the tasker's intent and a list of key indicators that signify accomplishment of the effect. In addition, the measures of merit act as qualifiers specifying the degree of the effect, intended duration, and any necessary constraints imposed on creating the effect.[23] This hard analytical forethought does not guarantee success, as that is impossible; but it decreases the impact of unintended consequences and thereby increases the likelihood of success.

Having become more familiar with the scope and complexity of effects-based operations, the question now becomes—is this a new idea? For that answer, we turn to a variety of prominent military and airpower theorists.

Notes

1. The author's introduction to effects-based targeting came from Col David A. Deptula, "Firing for Effect: Change in the Nature of Warfare," *Defense and Airpower Series* (Arlington, Va.: Aerospace Education Foundation, 1995). In this article, Colonel Deptula presents effects-based targeting as almost inextricably tied to a new form of warfare—control warfare—which he offers as "the antithesis of attrition and annihilation warfare." However, this study views effects-based operations as an overarching method of employing combat capability not directly linked with *any* specific strategy of war. Therefore, this study does not address the pros and cons of annihilation, attrition, exhaustion, or control warfare.

2. "Strategic and Indirect Effects: Defining and Modeling," USAF Doctrine Center, n.d., n.p., on-line, Internet, 3 December 1999, available from http://www.doctrine.af.mil/Application/Issues/StratEffects.pdf, 11–14. The definitions given are drafts proposed for inclusion in the next Air Force Doctrine Document (AFDD) 2-1, *Air Warfare*.

3. Ibid., 12.

4. Maj Jay M. Kreighbaum, "Force Application Planning: A Systems-and-Effects-Based Approach" (master's thesis, School of Advanced Airpower Studies [SAAS], 1998), 50, 62–63.

5. Ibid., 55, 67.

6. This taxonomy—physical, systemic, psychological—most closely matches that used by the USAF in its assessment of wartime effects. Combat assessment (CA) is an overall evaluation of combat operations in relation to command objectives. CA consists of three subassessments: battle damage assessment (BDA), munitions effectiveness assessment (MEA), and mission assessment (MA). MA addresses the effectiveness of broad apportioned missions, such as interdiction, counterair, and so forth. MEA analyzes the effectiveness of munitions damage mechanisms––for example, fuzing, against specific target types. USAF

guidance further subdivides the often overshadowing pillar, BDA, into assessments of physical damage, functional damage, and target system. A physical damage assessment is an estimate of the extent of physical damage to a target based on observed or interpreted damage. A functional damage assessment estimates the remaining functional or operational capability of a targeted facility or object. Lastly, in target system assessment, the combatant command fuses the previous component BDA reporting on functional damage to targets within a target system and assesses the overall impact on that system's capabilities. See Air Force Pamphlet 14-210, *USAF Intelligence Targeting Guide,* 1 February 1998, 70–72. This Air Force guidance is both enlightening and interesting. First, it is enlightening in that the focus is completely on the left side of the physical, systemic, psychological spectrum with no emphasis on the right (nonphysical) side and second, the sole source of Air Force direction and doctrine on this topic is found in a *pamphlet*, arguably the lowest and least influential block in the hierarchy of official Air Force publications. Fortunately, joint publications contain substantially more information on the topics of CA and BDA; but even so, many of these are available only in draft versions. Of interest here is Joint Publication (JP) 2-01.1, *Joint Tactics, Techniques, and Procedures for Intelligence Support to Targeting,* which describes BDA as being conducted in three phases. Phase one BDA is an initial analysis, based primarily on visual observation of the target. Reports from this phase state whether a target was hit or missed and offer an initial estimate of damage. Phase II analysis, or supplemental BDA, amplifies the initial analysis by drawing on all source intelligence and operational data to determine the target's functional damage and provide an initial estimate of impact to the target system. Phase III BDA fuses all supplemental BDA with the experience of subject matter experts to provide the joint force commander with an estimate of the remaining capabilities of the targeted system. See the preliminary coordination draft of JP 2-01.1, on-line, Internet, 7 April 2000, n.p., available from http://delphi.dia.ic.gov/intel/j2/j2t/issues/DOCTRINE/2-01.1.

7. This categorization, based on examining effects within the four elements of national power, is the taxonomy employed by the Joint Warfare Analysis Center (JWAC). Chapter 7 of this study provides a more detailed description of the JWAC operation.

8. JP 1-02, *DOD Dictionary of Military and Associated Terms*, n.d., on-line, Internet, 1 February 2000, available from http://www.dtic.mil/doctrine/jel/doddict.

9. Ibid.

10. Kreighbaum, 19, 69, 72–73, 110, 121. Major Kreighbaum provides significantly more on the topic of effects and their relationship to the levels of war.

11. While it is tempting to view this matrix vertically and infer relationships between the various classifications, such conclusions dangerously gloss over relationships between categories and ignore other characteristics, such as the cumulative, cascading, and distributive properties of effects.

12. USAF Doctrine Center Web site, "Strategic and Indirect Effects," USAF Doctrine Center, n.d., n.p., on-line, Internet, 3 December 1999, 17–18, available from http://www.doctrine af.mil/Application/Issues/StratEffects.pdf.

13. Steven M. Rinaldi, *Beyond the Industrial Web: Economic Synergies and Targeting Methodologies* (Maxwell Air Force Base [AFB], Ala.: Air University Press, June 1995). This study extensively covers the interrelatedness of national economic systems. Specifically, he states, "the targeting implications are clear: interactions between target sets must enter the decision making process if the global effects of air attacks are to be determined."

14. "Strategic and Indirect Effects," 16.

15. This example is somewhat simplistic, and the results from a planning perspective are not unforeseeable. However, it does provide some indication of the far-reaching ramifications of a single action.

16. JP 0-2, *Unified Action Armed Forces (UNAAF)*, dated 24 February 1995, n.p., on-line, Internet, 1 February 2000, available from http://www.dtic.mil/doctrine/jel/capstone.htm.

17. The national security objectives, determined by the National Command Authorities, drive the national security strategy required to achieve those objectives. The national security

strategy, in turn, determines the focus of our national military objectives. These, in turn, drive the supporting national military strategy and so on all the way down to individual tactical operations. In the end, the air strategy employed in any given conflict should directly contribute to the achievement of air objectives, which––by design––should directly support the successful execution of the overall theater strategy and so on. This congruent support eventually yields the successful achievement of our national security objectives.

18. Rinaldi, 48; and Kreighbaum, 51. Since this process begins with the desired objective or effect and works backward rather than beginning with available targets and working forward, this process is considered output-based as addressed by Rinaldi, or objective-based as discussed by Kreighbaum.

19. Col Phillip S. Meilinger expresses this insight in his *10 Propositions Regarding Air Power* (Air Force History and Museums Program, 1995), 20. "In essence, Air Power is targeting, targeting is intelligence, and intelligence is analyzing the effects of air operations." Unfortunately, we too often stop after the first phrase.

20. Maj Kevin L. Fox, Headquarters USAF/XOCI, draft memorandum, "Effects Based Operations (EBO) CONOPS," 27 September 1999, 5–6.

21. Ibid., 53–55.

22. *Gulf War Air Power Survey (GWAPS),* vol. 2, "Operations and Effects and Effectiveness" (Washington, D.C.: Government Printing Office, 1993), 25–75. This entire section of *GWAPS* focuses on the distinction between effects and effectiveness and the difficulty with capturing and measuring effects. See also Kreighbaum, 52–54. One great example for distinguishing between effects and effectiveness is the World War II Doolittle raid on Japan, which had negligible physical effects but was extremely effective psychologically.

23. Maj John N. Sims, Headquarters USAF/XOCI, draft memorandum, "Effects-Based Operations: The Road Ahead," 29 January 2000, 10.

Chapter 3

The Theoretical Basis

Too often vision has outrun reality and resulted in disappointment and reaction.

—Robin Higham

"The evaluation of the effects of aerial bombardment operations . . . has been raised to first importance by the maturing of air power in the present conflict. No established methodology has been evolved, however, for making such an evaluation; in fact, the exact nature and scope of the problem itself . . . are not generally understood."[1] Given these thoughts regarding the CBO of World War II, concerns over the effects of bombing are obviously not new. In fact, when we review airpower strategy's historical development, it becomes apparent there is a common thread throughout the writings of prominent theorists. The desire to control the enemy rather than simply destroy him is a unifying element, which suggests that effects-based operations are not new at all but rather as old as airpower employment itself and, in fact, still evolving.

Douhet

In 1921 Giulio Douhet authored the first major theory of airpower and was one of the first to consider specific effects as he developed his employment concepts.[2] Although he advocated a strategy of neutralizing enemy forces by striking their functional essentials of supply, transportation, and fuel, his primary mechanism for defeating the enemy lay in bombing vital civilian centers. Victory lay not in annihilation, but in attacking the people's vulnerable moral resistance and, in so doing, breaking the enemy's national resolve to fight.[3] Douhet believed this would be quicker and thus more humane than the abhorrent trench warfare of World War I. He saw destruction merely as an expedient to generate specific effects that, in turn, would achieve the ultimate objectives.

Mitchell

William "Billy" Mitchell, a contemporary of Douhet, shared many of his views, and though his theory of airpower employment evolved through the interwar years, his inventory of vital centers—the enemy's military forces, his transportation, industry, and the will of the people—did not.[4] Shortly after World War I, Mitchell believed an air force's principal mission was to destroy the enemy's air force and attack his military forces on the ground.[5] However, between the 1920s and the 1930s, Mitchell's conception

of the primary mechanism for victory shifted from defeating fielded military forces to defeating the will of the people;[6] and by 1933 he considered industry to be the target most vulnerable to airpower's unique capabilities.[7] Thus, Mitchell's beliefs evolved from employing airpower in a force-on-force, tactical-attrition manner to exploiting functional effects at the strategic level of war.

Slessor

In the 1930s, J. C. Slessor, a Royal Air Force (RAF) officer, lectured at Britain's Army Staff College; and in 1936 he published his compiled lecture notes in a book titled *Air Power and Armies.* Slessor reminded readers that independent air operations against a country's vital centers are a primary function of airpower; however, given his original audience, Slessor focused on employing airpower in conjunction with a land campaign in which British expeditionary forces had been committed.

Considering the enemy to be a system, he consequently looked for ways to influence that system. Slessor believed that, though first-order destruction may be a requisite means, the functional effects thereof are ultimately the desired outcome. The following statements reflect this mind-set and preference for emphasizing functional effects over physical ones:

> Strictly speaking a vital centre is an organ in a man, an army, or a nation, the destruction or even interruption of which will be fatal to continued vitality. Note that actual *material destruction* of a vital centre is not *essential* in order to be fatal (emphasis added).[8]

> This then is the *object* of attack on production, the dislocation and restriction of output from war industry, not primarily the material destruction of plant and stocks [emphasis in original].[9]

Even though Slessor saw airpower as potentially decisive at all three levels of war, he focused on its employment at the operational level. Two "not necessarily mutually exclusive" alternatives formed his mechanism for defeating an army: (1) subdue the actual ground forces, and (2) disrupt its critical supply function. Importantly, he argued that if you could cripple a force's fighting efficiency using functional means, then it did not require defeat in detail. Pursuing these thoughts on disrupting supply, Slessor proposed that airpower be used both in a strategic role—to interdict war production—and in an operational mode, to interdict essential supplies.[10] He suggested that commanders coordinate the use of land and airpower—with land power stressing the enemy force—driving up its needs for communications, supply, and reinforcements, while airpower simultaneously isolated the enemy land force, starving it of sustainment and control.[11]

Lastly, Slessor realized that identifying these vital centers on which to concentrate aerial attacks required comprehensive intelligence and meticulous analysis.

> The method of attack on production . . . demands a detailed and expert knowledge of the enemy's industrial system, of the communications linking the different parts of the system, and of the installation supplying it with power and light. Detailed intelligence about the enemy must be supplemented by *expert technical advice* from representatives of our own supply and transport services. (emphasis in original).[12]

This would not be the last time the efficacy of airpower would be linked with an in-depth knowledge of the target.

Air Corps Tactical School

Nowhere was belief in airpower's inherent offensiveness and strategic potential stronger than at the US Army Air Corps Tactical School (ACTS), established in 1920. Here, lecture notes reveal a deep appreciation for the potential of creating cascading effects: "Interlaced social, economic, political and military divisions of a nation acquire a state of absolute interdependence during war. Offensive action in one of these spheres will produce sympathetic disturbances of varying intensity in all the others."[13] With these thoughts in mind, the ACTS went on to introduce a precursor to today's nodal analysis and developed a strategy, later dubbed the "industrial web theory," for targeting the enemy's national economic structure. One 1939 ACTS lecture posits that attack should concentrate "on those vulnerable elements having the greatest cumulative effect."[14] Again, the focus lay not in material destruction but in disorganizing a society and crippling its economy—in essence, functional effects. Additionally, as with Slessor, the ACTS acknowledged that gathering complete target intelligence was "a study for the economist, statistician, or technical expert, rather than the soldier."[15]

Destroying the enemy's will to resist was the primary mechanism ACTS intended to employ.

> If morale is high, a nation or army can carry on against great odds and severe reverses . . . if morale power is low, defeat is quick and certain. . . . The resources of a nation for the waging of war are contained in its social, economic, political and military systems. Pressure, or the threat of pressure, against these systems will break down morale and cause the defeat of a nation.[16]

Thus, breaking down the enemy's will to resist was directly linked to collapsing the enemy's economy and reducing his military capability.

Eccles

Adm Henry E. Eccles believed logistics, on the national scale, had received inadequate analytical effort; and this perplexed him because he also believed that strategy largely evolves out of the economic situation. Moreover, his thoughts on affecting the enemy emphasized control and influence as well as destruction. Not surprisingly then, Eccles's means of control concentrated on the enemy's logistics, which he saw as the link between a nation's economy and its combat forces. "Both the enemy's

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armed forces and his economy become targets for destruction or control. His logistics system, being the bridge between his economy and his tactical ops, becomes a particularly important target."[17] Without naming specific targets, Eccles advocated denying the enemy his control functions and interdicting his control elements, which, if successful, made destroying those elements unnecessary.

Defining logistics as "the creation and sustained support of combat forces and weapons," Eccles essentially suggested that the best means to influence an adversary was through a systemic approach, by attacking the enemy's logistical control system at the operational level thereby influencing his functional ability to sustain the war.[18] Lastly, his overall approach to warfare was distinctly effects-based, reaching beyond even the systemic to the psychological, as his following statement reveals. "Not only must one think of how the enemy views the situation as it exists before one takes action, but one must think of how the enemy thinking will be influenced by the action one takes."[19] Eccles's psychological bent shares much with the next theorist who believed that real war takes place in the mind of the enemy.

Schelling

Thomas C. Schelling's often cited *Arms and Influence* deals primarily with nuclear deterrence, yet it spends a great deal of time developing a theory of coercion useful in limited, conventional warfare. Schelling sees the conflict in terms of psychological influence and potential to modify behavior by employing both the threat and actual use of gradually escalated force. "It is not the pain and damage itself but its influence on somebody's behavior that matters" in the application of force.[20]

Optimized at the strategic level of war, Schelling's strategy targets the enemy's government and its population.[21] He classifies the use of force in two categories––brute force and coercion––which he differentiates based on intent, purpose, and effect.[22] The intent of a brute force strategy is to *eliminate* behavior through outright destruction and extermination. Conversely, a coercive strategy seeks to *change* enemy behavior by manipulating risk through increased threat and, if required, using force selectively. Explicitly emphasizing influence (i.e., subsequent order effects) over destruction, Schelling characterizes "the importance of war and threats of war as techniques of influence, not of destruction; of coercion and deterrence, not of conquest and defense; of bargaining and intimidation."[23] Thus, where Eccles only obliquely mentions war's psychological aspect, Schelling deals with it almost exclusively; yet neither theorist identifies specific targets.

Warden

Col John A. Warden III, a retired Air Force fighter pilot, contends that all strategic entities can be analyzed as a system and broken down into

five component parts.[24] His model arrays these in the form of five concentric rings—a targeting bullseye of sorts—with the system's most crucial element, its leadership, forming the innermost ring. Extending outward from the leadership center are rings of organic essentials, infrastructure, population, and fielded forces in descending order of importance to the system's overall function.[25]

The central theme of the five rings model is that the most effective strategic plan always focuses on leadership, first and foremost. Even if leadership is unavailable as a target set, the air strategist must still focus on the mind of the commander when selecting targets from among the other rings. For within these rings lie centers of gravity (COG) which, when hit, impose some level of physical paralysis, thereby raising the costs of further resistance in the enemy commander's mind.[26] The implicit message is that destruction or neutralization of the leadership COGs will produce total *physical* paralysis of the system, whereas successful attack upon COGs within other rings will produce partial physical paralysis and unbearable *psychological* pressure upon the leadership.[27]

Though his primary mechanism is "strategic paralysis," in which the functional loss of leadership is central, Warden also believes in the fabled "death of a thousand cuts" as evidenced by his statement that "technology has made possible the near-simultaneous attack on every strategic- and operational-level vulnerability of the enemy."[28] This type of "parallel war" has also become a defining pillar in the thoughts of our next theorist.

Deptula

Of all the theorists surveyed, Brig Gen David A. Deptula, a Warden protégé, speaks most directly to the campaign planner's pursuit of effects versus simple destruction. He proposes employing force most efficiently by linking efforts to objectives via effects-based planning.

Deptula repeatedly emphasizes targeting for effect—rather than for destruction alone—and maintains that destruction is not an end in itself, but merely a means to achieve the desired effect of disabling the enemy's vital control systems.[29] For these vital systems, he echoes Warden's five target sets and primarily seeks systemic rather than physical or psychological effects. In his words, "Action to induce specific effects rather than simply destruction of the subsystems making up each of these strategic systems or 'centers of gravity' is the foundation of the concept of parallel war. . . . At the edge of the twenty-first century the significance of the evolution of change in warfare lies in the way we think about it."[30] Additionally, he emphasizes the importance of understanding "how time and space are exploited in terms of what effects are desired and for what purpose at each level of war."[31] Deptula argues that disabling the adversary's ability to control his essential systems at the operational level will paralyze his ability to function at the strategic level. "At that stage, the

enemy has no choice but to acquiesce to the will of the controlling force or face ever increasing degrees of loss of control itself."[32]

Pape

Robert A. Pape's "denial" strategy seeks to "thwart the enemy's military strategy" and deny the opponent his objectives.[33] Building on Schelling's contention that the goal of coercion is political change, Pape focuses on "strategic effectiveness, not combat effectiveness."[34] He maintains that once the opponent is convinced that he cannot achieve his military and political objectives, the cost of further resistance outweighs the benefits of that behavior, so he will concede to the coercer's demands. As he asserts that a hostile state's principal means of obtaining its objectives is via its military forces, we can classify his denial strategy as counterforce, setting him significantly apart from the other theorists in this survey. In fact, Pape would agree with the label, as he bluntly states that denial "entails smashing enemy military forces, weakening them to the point where friendly ground forces can seize disputed territories without suffering unacceptable losses."[35]

Summary

As one can see, each theorist conceived a different mechanism for forcing his will upon the enemy, yet each recognized that the ultimate determinant lay not in destroying targets, but in generating higher-order effects. Given their diverse claims and those of their disciples, let us now see what the crucible of war has taught us about planning for and generating these higher-order effects.

Notes

1. "Effect of Combined Bomber Offensive," July 1943, Air Force Historical Research Agency (AFHRA) document no. 142.042-7, frame 1053.

2. Giulio Douhet, *The Command of the Air*, trans. Dino Ferrari (1942, new imprint, Washington, D.C.: Office of Air Force History, 1983).

3. Ibid., 22, 25, 57, 126.

4. William "Billy" Mitchell, *Winged Defense: The Development and Possibilities of Modern Airpower—Economic and Military* (New York: Dover Publications, 1988), 127.

5. William "Billy" Mitchell, "Air Service Tactical Application of Military Aeronautics," staff paper, 5 January 1919, AFHRA document no. 167.4-1, 1.

6. Contrary to Douhet, Mitchell did not advocate direct attack of the civilian population.

7. Col Phillip S. Meilinger, School of Advanced Airpower Studies (SAAS) lecture notes on "Mitchell" for course 631, Maxwell Air Force Base (AFB), Ala., 1993.

8. J. C. Slessor, *Air Power and Armies* (London: Oxford University Press, 1936), 16.

9. Ibid., 66.

10. Ibid., 63.

11. Ibid., 213.

12. Ibid., 89.

13. Air Corps Tactical School (ACTS) lecture no. 5, "Air Force Objectives," 27 February 1935, 2. From AFHRA document no. 248.2016A-12.

14. Maj Muir S. Fairchild, ACTS instructor, "Air Force: National Economic Structure," ACTS lecture nos. AF-9 and 10-C, 5 April 1938; and AFHRA document no. 248.2019A-10. Based on pencil changes and marginalia, it appears this lecture was updated for presentation in 1939.

15. Maj Muir S. Fairchild, "New York Industrial Area," lecture no. AF-11-C, 6 April 1938; and AFHRA document no. 248.2019A-12. Based on pencil changes and marginalia, it appears this lecture was updated for presentation in 1939.

16. Lecture, "Air Force Objectives," 159.

17. Henry E. Eccles, *Logistics in the National Defense* (Harrisburg, Pa.: Stackpole, 1959), 30.

18. Ibid., 22.

19. Ibid., 25. Eccles offers no suggestions as to how best to accomplish this lofty mental pursuit, and one cannot help after reading this but to think of the 1943 staff planner's comment that "to now have stated the problem, is not to have solved it."

20. Thomas C. Schelling, *Arms and Influence* (New Haven, Conn.: Yale University Press, 1966), 3.

21. Ibid., 180.

22. Ibid., 5.

23. Ibid., 33.

24. John A. Warden III, "Strategic Warfare: The Enemy as a System," in *Concepts in Airpower for the Campaign Planner*, Lt Col Albert U. Mitchum, ed. (Maxwell AFB, Ala.: Air Command and Staff College, 1993), 4. He is also known for his earlier work, which, without explicitly providing the five-rings model, strongly alludes to it. It is *The Air Campaign: Planning for Combat* (Washington, D.C.: Pergamon-Brassey's, 1989).

25. Ibid., 6.

26. Note that Warden's use of the plural "centers of gravity" (COG) implies that a single entity has or may have multiple COGs. This is in conflict, not only with the physical science lexicon from which we borrow this term but also with Carl von Clausewitz, who first used this term in discussing his thoughts on war over 150 years earlier than John Warden. Clausewitz retains the scientific use and implies only a single COG per entity.

27. Maj David S. Fadok, *John Boyd and John Warden: Air Power's Quest for Strategic Paralysis* (Maxwell AFB, Ala.: Air University Press, February 1995), 25. From Fadok's personal interview with Warden, 17 February 1994.

28. Warden, *Strategic Warfare*, 8.

29. Ibid., 4, 8, 10, 12, 17.

30. Col David A. Deptula, "Firing for Effect: Change in the Nature of Warfare," *Defense and Airpower Series* (Arlington, Va.: Aerospace Education Foundation, 24 August 1995), 5, 12.

31. Ibid., 4.

32. Ibid., 6.

33. Robert A. Pape Jr., *Bombing to Win: Air Power and Coercion in War* (Ithaca, N.Y.: Cornell University Press, 1996), 69–79.

34. Ibid., 58.

35. Ibid., 69–79.

Chapter 4

Operation Pointblank

It is apparent . . . that the problem of bomb damage assessment involves more than a mere appraisal of physical damage. . . . To state the problem . . . is not, however, to solve it.

—Response to 1943 Chief of Staff tasking

The calculation of effects of bomb damage on an industry is largely speculative . . .

—Opening line to intelligence report on
results of Combined Bomber Offensive
1 November 1943

Historical Description

After annexing Czechoslovakia and a portion of Lithuania in early 1939, Germany invaded Poland on 1 September, beginning what we would come to know as World War II. Initially, the Allied powers of Britain, France, and later the Soviet Union fought without the aid of the United States, whose international policy was still isolationist, but that changed on 7 December 1941 when the Japanese attacked Pearl Harbor and the Philippines. Over the next year, America sent over men, money, and equipment building up military forces and beginning operations against the Axis powers. Then, in June 1943, the British and Americans launched the CBO, code-named Pointblank, as the first large-scale, concerted, strategic air offensive against an industrialized nation. Planning, however, had begun long before the first bombs fell.

Prompted by the 1938 Munich crisis to believe a large air force could offensively deter further German aggression, President Theodore Roosevelt spent the next three years preparing for war while simultaneously trying to prevent the same.[1] Part of the preparations included an early 1941 secret conference in Washington, D.C., to determine Anglo–American strategy should Britain and the United States find themselves at war with both Japan and the European Axis. The final report, later known as American British Conversations (ABC)-1, provided the following assumptions: the European theater was primary, German defeat would probably entail an invasion of northwestern Europe, and offensive measures would include "a sustained air offensive against the German military power."[2] These assumptions then guided changes to the US military's current operations plan, Rainbow-5.

On 9 July 1941, President Roosevelt directed Secretary of War Henry L. Stimson to provide "the overall production requirements necessary to defeat our potential enemies." This being the only national policy guidance given, the Joint Army–Navy Board tasked each service to develop its own requirements within the guidance of ABC-1 and Rainbow-5. The Air War Plans Division of the Air Staff wrote Air War Plans Document (AWPD)-1, which established the basic strategy later employed in Pointblank.[3] This document tasked US air forces with conducting a sustained air offensive against Germany to destroy its capability and will to continue the war and make an invasion either unnecessary or feasible without excessive cost.[4] Other tasks, such as supporting land forces, followed. From these tasks flowed the strategic targeting priorities of disrupting German electric power, transportation, and oil/petroleum systems. Not to ignore German air defenses, the plan also included an "overriding intermediate objective" of neutralizing the Luftwaffe. As AWPD chief of the European branch Haywood S. Hansell would later note, "The key element in the entire plan was the proviso that the full bomber force should devote its entire strength to these targets for six months after it had reached maturity." On 1 September 1941, Gen George C. Marshall and Secretary Stimson approved AWPD-1 without change.[5]

Exactly one year later, in response to a presidential tasking for a statement of Allied requirements "to have complete air ascendancy over the enemy," Army Air Force (AAF) planners issued AWPD-42, essentially a restatement of AWPD-1.[6] The most significant changes involved including the British RAF in a nighttime bombing role to complement American AAF daylight attacks, providing air support for a land offensive in Northwest Africa and operations in the Middle East, and adding German submarine yards as a second priority behind Germany's aircraft industry.[7] This guidance then served as the basis for AAF strategic planning until Franklin Roosevelt and Winston S. Churchill met in January of 1943.

The American and British heads of state and their Combined Chiefs of Staff (CCS) gathered to discuss Allied strategy. Seven days later, CCS 166/1/D, now known as the "Casablanca Directive," tasked Allied bomber forces in England with "the progressive destruction and dislocation of the German military, industrial, and economic system, and the undermining of the morale of the German people to a point where their capacity for armed resistance is fatally weakened."[8] Though directive in nature, this policy provided only general guidance without detailed objectives. Translation into specific taskings would fill the next few months.

Earlier in December 1942, the AAF formed the committee of operations analysts (COA) to select the best industrial objectives.[9] In March the COA issued a report, which became the basis for a combined operations plan. Identifying Luftwaffe's strength as "an intermediate objective second to none in priority," it then listed the other priorities as German submarine yards and bases, the remainder of the German aircraft industry, ball bearings, oil, synthetic rubber and tires, and military motor transport

vehicles.[10] Presented in May 1943 to the CCS at the Trident Conference in Washington, this plan became the CBO.

From July to December 1943, while RAF Bomber Command terrorized German cities at night, US AAFs launched daylight, precision attacks against German aircraft and antifriction bearing industries. Though the attacks did not destroy much of the industrial machinery, they did force dispersal of those operations at a crucial point in the war.[11] However, following excessively heavy losses in October, American authorities curtailed deep strikes until the P-51 Mustang began arriving in-theater in December. As soon as industrial attacks resumed with P-51 escorts, the toll on Germany was unmistakable; and Big Week (20–25 February 1944) culminated a decisive tactical Allied victory from which the Luftwaffe never recovered, though there would still be Allied losses to the end.

Once the Anglo–American air forces achieved their "overriding intermediate objective," it became apparent that––though many airmen believed airpower alone could strategically topple Germany––this view was not controlling the overall Allied strategic plan. In the months preceding D day, it became increasingly apparent to Allied air commanders what the Casablanca Directive authors intended when they wrote, "to permit initiation of final combined operations on the Continent."[12] While Gen Carl A. Spaatz, commander of the US Strategic Air Forces in Europe, believed the AAF should exploit daylight air superiority by destroying vital German targets––namely oil––which would significantly shorten the war, Gen Dwight D. Eisenhower, supreme commander of the Allied Expeditionary Forces, was not completely convinced such targeting would yield the promised returns. Consequently, when the strategic air forces fell under his command in March 1944, the demands of the invasion received priority from all Allied air forces and he called for a transportation attack plan to directly support Operation Overlord.[13] Even then, however, Eisenhower deferred to Spaatz's judgment somewhat and allowed American bomber forces to devote a small number of their raids to oil production facilities during the invasion preparation. Following Normandy, these efforts became the primary aim of US strategic air operations. Combined with the ongoing assault on German transportation and the unstoppable Allied ground offensive, this contributed to Germany's final collapse. On 16 April Spaatz declared the strategic air war over, and on 8 May 1945, President Harry S. Truman declared Victory in Europe.[14] Given this history, were the concepts of effects-based operations present in the air operations of the mid-1940s?

The Plans

Interestingly, the issue of how to employ the massive British and American bombing forces in the two months preceding D day dealt specifically with effects, and especially the timing thereof. Air Chief Marshal Sir Arthur Tedder, Eisenhower's deputy in command of Overlord, argued that systematic devastation of the rail facilities in northwestern Europe would

delay and hinder the movement of German reinforcements and supplies and was, therefore, the optimum method for assuring a successful invasion. General Spaatz responded that a systematic attack on German oil production would accomplish the same with the added benefit of luring the Luftwaffe airborne for subsequent attrition. Spaatz lost this initial confrontation due to the issue of timing. Most Allied leaders believed the effects of an oil attack would not manifest themselves for four or five months, which was not soon enough for Eisenhower.[15] Thus, effects were a key issue for commanders, but planners were interested also.

The Economic Objectives Unit (EOU) of the Economic Warfare Division in London acted as a target planning staff for the American bomber forces in Europe.[16] By conducting economic analyses of German systems, their work served as the basis for selecting broad target systems.[17] Additionally, one of their principal contributions to the CBO were aiming-point reports. By war's end, the EOU was credited with "the minutely detailed research into the operation, design, and construction of every individual target which the Eighth Air Force decided to destroy by bombing."[18] Given their influence, it is enlightening to examine their mode of operations.

The EOU insisted on choosing targets in light of explicitly defined military goals, as opposed to attacks designed simply to weaken the German economy or cause political disruption in some general sense. Consequently, they sought systems in which destroying the minimum number of targets would have the greatest, most prompt, and most long-lasting, direct, military effect. Their aiming-point reports were analyses of particular German industrial plants designed to establish the most vulnerable point of attack. Accompanying text would state

  a. the effect on the plant if the vulnerable point was destroyed,
  b. how long it would likely take the Germans to repair the damage, and
  c. the effect on German war potential if the plant was out of action to the extent given in (a) for the period of time given in (b).[19]

The EOU was very much aware that "a more difficult and more important problem is the measurement of impairment of the enemy's war effort." The answer, at least initially, seemed to be "that some arbitrary index must be set up if an answer in quantitative form is to be obtained." They determined another solution would be to set a more specific objective, such as injuring enemy air strength, instead of impairing his effort.[20] Given these discussions, it is evident that effects played a key role in target identification; however, selecting targets was one thing, actually hitting them from the air was something entirely different.

The Execution

Even when Allied aircraft finally established air superiority in the spring of 1944, "precision" bombing of a single target still required approximately 1,000 aircraft. Over the duration of the Second World War, only about 20

percent of the bombs aimed at targets designated for precision attack fell within 1,000 feet of their aim point.[21] Moreover, the minimum bomb pattern bombers could deliver was typically larger than the area of the industrial plant being targeted. Thus, simply aiming for the plant's geographic center obviated any detailed selection of a specific component within the industrial plant.[22] Influencing even a single target set required the Allies to repeatedly mass such large numbers of aircraft that the AAF typically attacked target sets sequentially over a period of months. For example, operations against the ball bearing and aircraft production industries lasted seven months. It took five months to wreck the transportation system, and the oil system required six months. Focusing this much time on each target allowed other target sets to recover and amply demonstrated the German economy's resilience and robust nature.[23]

Additionally, before the P-51 Mustangs established air superiority, large bomber formations were attractive and vulnerable targets for the German air force, as the Schweinfurt and Regensburg raids tragically demonstrated in August and October 1943. With loss rates of 15 and 16½ percent respectively, and 20½ percent on a second Schweinfurt raid, a total of 118 bombers failed to return from those three missions. At final tally, the raids succeeded in destroying a number of buildings but not the heavy industrial machinery inside.[24] The destructive capability was just not present, but planners did not know this until after the war. So how did analysts make real-time combat appraisals in 1943?

The Assessment

The short answer is photo intelligence. This chapter's opening epigraph, stating, "the problem of bomb damage assessment involves more than a mere appraisal of physical damage," alludes, however, to the longer, more accurate answer. In fact, intelligence collection in World War II involved economic studies based on prewar statistics and extrapolated wartime production levels, elaborate networks of informants, well-placed observers, and analyses of system components and designs by technicians thousands of miles from any combat theater—all this in addition to photo intelligence.[25] Not to be forgotten, however, is signals intelligence (SIGINT), which evolved into a primary source of air intelligence. But evolution takes time, if it occurs at all.

In the beginning, was the photograph and for the strategic air operations of World War II photo intelligence remained the backbone of air intelligence to a very great extent. Photographs were essential for planning, executing, and evaluating practically every aspect of air combat operations and were so essential for target folders that, for the majority of the war, missions were canceled unless the proper photos were available. Photo-reconnaissance provided the basis of bomb damage assessment (BDA), and Spaatz declared them to be "of utmost importance" because the "determination of [follow-up] operations depends on photographic reconnaissance unit (PRU) reports." Consequently, acquiring and interpreting the necessary

photographs were "of the highest priority, over all other activity."[26] To this end, a portion of every American bomber formation carried cameras to record their results real time. Unfortunately, however, scenes of walls collapsing, fires blazing, and smoke rising were better for morale than intelligence, as they often suggested greater damage than had actually occurred. Moreover, as if assessing the extent of physical damage to the target was not hard enough, analysts still had to assess how destroying the target impacted the system's industrial output and, in turn, how that change in production capacity affected the enemy's total military capability. As time would tell, interpreters––even when evaluating first-order destruction correctly––tended to overestimate second-order effects on industrial output.[27] Consequently, estimating cumulative and cascading effects on the enemy's total war effort was simply a guess––sometimes educated––but still a guess. Thus, even when available, photos rarely if ever yielded complete intelligence; and sometimes they simply were not available, such as when the weather over Europe precluded effective aerial reconnaissance. Fortunately, the Allies had another tool with which to complement photo intelligence, SIGINT.

SIGINT, more specifically, ULTRA (interception and deciphering of highly classified German electronic transmissions) and Y-intelligence (interception of plain-language radio traffic) filled a great number of the intelligence gaps left by simple two-dimensional photographs.[28] However, throughout 1943, many ULTRA reports were "too vague and general to be of importance operationally," as the Germans sent most of their production information via landlines and civilian channels. Thus, aerial photography remained the assessment tool of choice. Nevertheless, by early 1944, ULTRA was contributing significantly to Allied analytical capability by supplying such information as a damaged facility expected "resumption of production in approximately 8 days." No photograph, regardless of its level of detail, could provide that type of information. But Allied air commanders needed exactly that kind of poststrike information to decide whether to restrike the same target or move to another.

Unfortunately, this type of information was not always available, and the following extract from a November 1943 CBO progress report indicates the results:

> Eighth Bomber Command have concentrated their attacks upon individual targets . . . selected in the light of their critical importance to the German war effort. Damage to such targets *must, therefore, have* proportionately greater effect upon the German military machine as a whole than damage achieved in the course of area attack, . . . Thus the attacks on the ball-bearing industry at Schweinfurt and the synthetic rubber plant at Hüls *have undoubtedly produced* far reaching effects throughout the range of German war industry. Similarly the ability to concentrate a series of day light attacks on a single vital system, as in the case of the attacks made upon the fighter factories . . . *are likely to have produced* effects within the industry far in excess of the sum of the visible damage (emphasis added).[29]

Sounding more like an optimistic argument than an objective assessment, the report demonstrates the difficulty Allied analysts had assessing subsequent order or systemic effects.[30] In the end though, the report confidently concludes, "All evidence indicates that the Combined Bomber Offensive is achieving a profound effect upon Germany's war economy, and upon the morale of her people."[31]

Lastly, it is important to realize that World War II decision makers were much more interested in what effects the missions they tasked were causing than they were in what those missions destroyed. In March 1944, when forced to decide whether to focus on marshaling yards or oil refineries, Eisenhower wanted to know how to reduce the movement of military traffic. Nevertheless, two months after he decided to hammer the enemy's transportation system, intelligence indicated essential military movements were still taking place. Though the Allies delivered more than 45,000 tons of bombs on German rail centers and achieved great destruction, they failed to achieve the objective effect because the enemy was successfully repairing and redistributing traffic to avoid the most badly damaged areas.[32] Contrast this with a November 1944 appraisal of the impact of oil attacks: "Local shortages of fuel have frequently appeared and have been an important factor in limiting vehicular traffic and restricting German panzer and air force operations. In view of Germany's critical oil stock position, continued attacks against the industry will further restrict ability of German ground and air forces."[33] Consequently, when analysts determined that bombing was not achieving the desired effects, air commanders changed their plans.

The Feedback and Response

The incorporation of intelligence information in subsequent decisions, and the results thereof, ultimately determine the true value of any intelligence. From this perspective, ULTRA proved its value repeatedly. Its contributions lay not in aiding the initial selection of targets but in its post-strike "proof" that the initial selection had been valid. It allowed airmen to prosecute their strategy, shifting from one target set to the next, with a degree of confidence that would have been unsubstantiated otherwise.[34]

The usefulness of ULTRA was most evident with respect to the German air force, which, fortunately for the Allies, was notoriously lax in communications security. As a result, the Luftwaffe's message traffic––specifically its daily reports––were absolute gold mines of intelligence. Almost every day, every combat unit of the German air force would report on the number of airplanes serviceable, the number of crews ready and fit to fly, and if there had been combat the day before, on the casualties and wins claimed.[35] This type of information regarding the Luftwaffe's attrition during Big Week produced a fundamental shift in operational planning the following month. Instead of avoiding German air defenses, operational planners designed missions so as to deliberately engage them. Subsequent results then formed the basis for Spaatz's March 1944 recommendation

that the Luftwaffe was sufficiently weakened to permit air commanders to refocus their attacks on oil.[36]

One of Tedder's responses to a piece of refinery strike intelligence exemplifies how influential effects-related information was in the Allied decision-making feedback loop. In April 1944, Fifteenth Air Force raided the oil refineries at Ploesti, Romania. Eighth Air Force followed several weeks later, substantially damaging a group of oil targets in central Germany. Intelligence, including ULTRA, revealed intense German distress concerning these losses. Tedder, an avid proponent of attacking German transportation, opposed making oil a priority because he felt the Americans could not deliver on their precision-strike promises. Nevertheless, in response to the intelligence, he replied, "I guess we'll have to give the customer what he wants."[37] Future intercepts validated that decision.

As early as June 1944, the German operational staff informed individual units that because of "encroachment into the production of aircraft fuel by enemy action . . . it has been necessary to break into the strategic reserves." Less than a month later, *Reichsmarshall* Hermann Göring decreed: "Drastic economy [in fuel use] is absolutely essential." Shortly thereafter, the German High Command ordered fighters not to fly away from bases under anticipated attack, due to fuel shortages. Based on this progressively more revealing intelligence picture, Spaatz advised that the German aircraft industry no longer be the primary target because German air operations were being hindered, not by lack of airframes, but lack of fuel and qualified pilots.[38] Hindsight, via intelligence feedback in this case, once again proved to have greater acuity than foresight; and other results would confirm this finding.

Results in Retrospect

According to the *US Strategic Bombing Survey (USSBS),* the CBO delivered almost 2.7 million tons of bombs while flying an equal number of fighter sorties and more than 1.4 million bomber sorties. The eventual costs included 79,265 American and 79,281 British lives along with more than 18,000 American and 22,000 British planes lost or damaged beyond repair.[39] Since Allied leaders made these investments based on real-time appraisals, how accurate were those initial appraisals, given the clarity of hindsight, and what else have we learned after the fact?

Working through the objectives established in the Trident's CBO Plan, the *USSBS* states that, by the spring of 1944, the German air force had ceased to be effective.[40] Though confident enough to continue with the planned D day invasion, Allied planners greatly overestimated the Luftwaffe's effective strength and its potential opposition to the Normandy landing. When asked the number of daylight air sorties analysts expected the Luftwaffe to fly against the invading forces on D day, estimates varied widely from 200 to 2,000.[41] Looking back, as recorded by Wesley Frank Craven and James Lea Cate, "one of the most remarkable facts of the entire war is that the Luftwaffe did not make a single daylight attack on

D day."[42] Though possibly based on worst-case assumptions, this overestimation typifies the Allies' early inability to forecast systemic effects without German self-assessment via ULTRA.

Conversely, the more planners incorporated ULTRA in the operational evaluations process, the more accurate their assessments became. Per the *USSBS*, attacks on the ball bearing industry showed no measurable effect on essential war production due to German reallocation, equipment redesign, and use of unaccounted-for stockpiles. The assistant chief of Air Staff and Intelligence disseminated this appraisal almost verbatim in a 15 November 1944 memorandum.[43] Once the Luftwaffe threat had been reduced, oil became the priority target; and from May 1944 on, German consumption exceeded production. Consequently, by the spring of 1945, gas shortages immobilized increasing numbers of the German tank force.[44] Again, Allied authorities made similar appraisals and predictions in late 1944.[45] According to the *USSBS*, the attacks on German railways and waterways completely disorganized the enemy's economy, reducing war production in all categories and limiting the German ground forces' tactical mobility. An interesting observation regarding this target category is not in the appraisal of the situation but in the Allies' unintended and unforeseen impact upon themselves. After successfully invading at Normandy, the Allies were unable to break out of the area rapidly via rail because they had previously destroyed the marshaling yards. As a result, they had to resort to less efficient truck convoys.[46] Nevertheless, in the end, Allied airpower proved decisive with complete victory in the air and substantial contributions elsewhere.

Summary

In the CBO against Germany, the Allies eventually succeeded in creating systemic effects that impeded the enemy's war-sustaining and war-making operations. This outcome tends to support interwar theories that airpower would create such effects by striking key points or vital economic centers; however, this success must be qualified. Combat experience revealed that it was very difficult, given existing technology, to deliver weapons precisely enough to execute strategic bombing doctrine. Wartime experience also revealed how critically dependent airpower strategists are on timely intelligence collection, interpretation, and assessment. Less than a quarter century would pass before history would reiterate these same lessons in the jungles of Southeast Asia.

Notes

1. Michael S. Sherry, *The Rise of American Air Power: The Creation of Armageddon* (New Haven, Conn.: Yale University Press, 1987), 22, 29, 49, 61–62, 79, 81.

2. Arthur B. Ferguson, "Origins of the Combined Bomber Offensive," in *The Army Air Forces in World War II*, vol. 2, *Europe: Torch to Pointblank, August 1942 to December 1943,*

eds., Wesley F. Craven and James L. Cate (Chicago: University of Chicago Press, 1949), 209–10.

3. For a personal account of this war plan's development, see Haywood S. Hansell Jr., *The Air Plan That Defeated Hitler* (Atlanta: Higgens-McArthur/Longino and Porter, 1972), 61–99. The official account is found in James Lea Cate and E. Kathleen Williams, "The Air Corps Prepares for War, 1939–41," in Craven and Cate, vol. 1, *Plans and Early Operations: January 1939 to August 1942*, 145–50.

4. Hansell, 76–77.

5. Haywood S. Hansell Jr., *The Strategic Air War against Germany and Japan* (Washington, D.C.: Office of Air Force History, 1986), 33–40.

6. Ferguson, 277.

7. Hansell, *The Air Plan*, 103–4.

8. "The Combined Bomber Offensive Progress Report (CBOPR), 4 February–1 November 1943," 7 November 1943, Air Force Historical Research Agency file no. 520.318, frames 1196–1297, Appendix A.

9. Prior to World War II, the "all-pilot Air Corps," struggling for survival, had no time or inclination to train officers in combat intelligence. See Thomas H. Greer, "Other Training Programs," in Craven and Cate, vol. 6, *Men and Planes*, 687. General Arnold's COA became the first single organization responsible for collecting and analyzing intelligence for the express purpose of air target selection. See Ferguson, 352–54.

10. Alan J. Levine, *The Strategic Bombing of Germany, 1940–1945* (Westport, Conn.: Greenwood Publishing Group, Inc., 1992), 85–87.

11. Walt W. Rostow, *Pre-Invasion Bombing Strategy: General Eisenhower's Decision of March 25, 1944* (Austin, Tex.: University of Texas Press, 1981), 26.

12. Hansell, *The Strategic Air War*, 78.

13. Levine, 128.

14. Ibid., 188.

15. Rostow, 4.

16. Ibid., 15.

17. John F. Kries, ed., *Piercing the Fog: Intelligence Air Forces Operations in World War II* (Washington, D.C.: Air Force History and Museums Program, 1996), 74.

18. Ibid., 138.

19. Rostow, 20–23.

20. Ibid., 104.

21. *The United States Strategic Bombing Surveys Summary Report: European War* (1945; reprint, Maxwell Air Force Base [AFB], Ala.: Air University Press, 1987), 13.

22. Rostow, 21.

23. Ibid., 18. See also Mancur Olson Jr., *The Economics of the Wartime Shortage* (Durham, N.C.: Duke University Press, 1963), 137–46.

24. Hansell, *The Strategic Air War,* 86.

25. Kries, 57.

26. Ibid., 58, 83.

27. Ibid., 90, 203.

28. For a significantly more detailed description of these, see Kries, chapter 2.

29. CBOPR, 3.

30. Such difficulties are also evidenced in "Status of Air Prerequisites for Operation OVERLORD," 29 March 1944, AFHRA file no. 142.042-13 V.1, IRIS reference A1255, frames 109–46.

31. Ibid., 11.

32. Rostow, 60, 93. For even more evidence showing concern over the enemy use vice the simple destruction of targets, see Rostow's Appendix F, which contains an interim report on German rail movement dated 19 June 1944.

33. "Strategic Bombing of Axis Europe: January 1943–September 1944, Bomb Damage to Axis Target Systems" (hereinafter cited as Strat Bombing 44) from the Assistant Chief

of Air Staff, Intelligence, Analysis Division, European Branch, 15 November 1944, AFHRA file no. 142.042-8, frames 1062–1193.

34. Kries, 75.

35. Diane T. Putney, ed., *ULTRA and the Army Air Forces in World War II: An Interview with Associate Justice of the U.S. Supreme Court Lewis F. Powell, Jr.* (Washington, D.C.: Office of Air Force History, 1987), 20.

36. Kries, 74, 207.

37. Rostow, 52.

38. Kries, 239–40.

39. *United States Strategic Bombing Surveys*, 5–6.

40. Ibid., 19.

41. Rostow, 147.

42. John E. Fagg, "Pre-Invasion Operations," in Craven and Cate, vol. 3, *Europe: Argument to V-E Day January 1944 to May* 1945, 166.

43. Strat Bombing 44, sec. II-C.

44. *United States Strategic Bombing Surveys*, 20–23.

45. Strat Bombing 44, sec. II-D.

46. Rostow, 156.

Chapter 5

Operation Linebacker II

To succeed, strategy must first of all be correct. If strategy is correct, but tactics happen to be wrong, the war will not necessarily fail entirely. On the other hand, tactics may well be correct, but if the strategy is wrong, in the long run, tactics will be of no use.

—Truong Chinh, Secretary-General
Vietnamese Communist Party

How can any man say what he should do himself if he is ignorant what his enemy is about?

—Baron Antoine-Henri Jomini

Historical Description

It is difficult to establish when the United States first became involved in Vietnam. As early as June 1950, President Harry S. Truman, as part of his message committing forces to Korea, promised to help France in its Southeast Asian struggle, though the aid was minimal and would prove insufficient. During the late 1950s, American nonuniformed personnel were active in South Vietnam; and in 1961, military advisors began arriving officially. By 1963 more than 17,000 American "noncombatants" were in-country with many covertly participating in combat operations against the North.[1] The underlying reason several administrations chose to involve the United States in this region was to contain communism. Failure to stop communist expansion in Vietnam would eventually lead to the domino-like fall of all Southeast Asia, or so it was believed.

On 2 August 1964, North Vietnamese patrol boats attacked the USS *Maddox*, a destroyer gathering intelligence in international waters off the North Vietnamese coast, and two days later, another attack allegedly occurred against the USS *C. Turner Joy*. Within a week, Congress approved the Gulf of Tonkin resolution giving the president broad powers to act in Vietnam and setting the stage for direct US combat involvement.[2] President Lyndon B. Johnson immediately ordered retaliatory air strikes, and the first ground combat troops, a Marine brigade, arrived in early 1965. The political objective of these actions was to ensure that North Vietnam did not forcefully overthrow the South Vietnamese political system.[3] Nevertheless, as gradualism characterized America's initial involvement in Vietnam, so too would it characterize its military strategy there.

Concurrent with the deployment of ground forces, the United States initiated Operation Rolling Thunder and began air strikes against North Vietnam. Opening with attacks on enemy lines of communication (LOC) just above the demilitarized zone (DMZ), the operation slowly crept northward toward the major cities of Hanoi and Haiphong while gradually expanding its target list to include POL, electrical power, and some industrial targets. Lasting almost four years, political decision makers dictated that Rolling Thunder be executed as a series of gradually escalating strikes, each followed by a bombing pause to permit the North Vietnamese to consider the consequences of future aggression.[4] This "signaling" never proved especially effective, and the enemy simply exploited the breaks as opportunities to recover, rebuild defenses, and rearm. Following one of these pauses, the Vietcong sensed an opportunity and launched the 1968 Tet offensive. Though a tactical military disaster for the Vietcong, Tet proved a psychological defeat and strategic political catastrophe for America. True to form, however, Johnson halted all bombing of the North in October that same year in exchange for Hanoi's agreement to negotiate seriously. Rolling Thunder ended, having made at best a meager contribution toward achieving Johnson's political goal of an independent, stable, non-Communist South Vietnam. US air efforts then shifted to interdicting the Ho Chi Minh Trail.[5] In the wake of Tet, America's objective in Vietnam clearly changed. Now the United States simply sought a way out with minimum damage to its prestige. Newly elected President Richard M. Nixon pursued this objective with his strategy of Vietnamization—turning the war back over to the South Vietnamese. Though deployment momentum continued briefly with the number of US forces in-theater climaxing at more than half a million by early 1969, Nixon began reducing American troop levels at an increasing rate.[6] By January 1972, only 139,000 Americans remained in Vietnam, and that number fell to 69,000 in April. Hanoi, again sensing the possibility of victory, launched its 1972 Easter offensive on 30 March guided by People's Army of Vietnam (PAVN) commander Gen Yu Nguyen Giap. Viewing the massive invasion as a desperate attempt to forestall Vietnamization, Nixon saw an opportunity for "withdrawal with honor" if he could defeat the assault and counterattack the enemy homeland, thereby compelling Hanoi to sign a favorable accord.[7]

With ground forces in decline, Nixon turned to airpower to blunt the enemy offensive; and air commanders obliged with Operation Linebacker. Designed to cripple North Vietnam's ability to conduct offensive operations inside South Vietnam, its objectives were twofold: (1) seal off North Vietnam from outside sources of supply and (2) cripple the North Vietnamese LOCs with its 14 divisions in the South. Combined with ground operations conducted by the Army of the Republic of Vietnam (ARVN), Linebacker had significant effect. By May the situation in South Vietnam was no longer critical, and by October the immediate threat had passed. Washington's objective returned to compelling North Vietnamese leaders to sign an acceptable peace agreement.[8]

With its offensive having failed and its territory and industry under increasing attack, North Vietnam came to the negotiating table and the formerly elusive peace agreement materialized quickly. Hanoi and Washington came to terms on 21 October 1972; and, two days later, Nixon suspended bombing north of the twentieth parallel, thus ending Operation Linebacker. Three days after the bombing stopped, national security advisor Henry A. Kissinger informed reporters "peace is at hand."[9] Unfortunately, it was not. Saigon refused to accept the negotiated terms agreed upon by Washington and Hanoi; and when peace talks resumed and stalled in late November and resumed again in early December, the North Vietnamese recanted on the majority of their earlier concessions. With negotiations at a standstill on 13 December, Kissinger decided future talks were pointless and advised Nixon "to turn hard on Hanoi and increase pressure enormously through bombing and other means."[10] As Kissinger explained after the war:

> We had come to the conclusion that the negotiations . . . were not serious; that for whatever reason, the North Vietnamese, at that point, had come to the conclusion that protracting the negotiations was more in their interest than concluding them. . . . At the same time, the more difficult Hanoi was, the more rigid Saigon grew. . . . And therefore it was decided to try to bring home, really to both Vietnamese parties, that the continuation of the war had its price.[11]

For the North, that price was Linebacker II.

On 14 December, President Nixon gave North Vietnam 72 hours to resume serious negotiations or face severe consequences. At 1945 hours on 18 December 1972, 48 B-52s making up the first of three such waves struck the Kinh No storage complex, the Yen Vien Rail Yard, and three airfields on the outskirts of Hanoi.[12] Linebacker II had begun and would continue striking targets in and around Hanoi and Haiphong both day and night for the next 12 days. The single exception was a 36-hour stand down for Christmas. In the end, the operation succeeded. At 1900 hours Washington time on the 29th, Nixon suspended all bombing north of the twentieth parallel after Hanoi announced it was willing to resume serious negotiations. Representatives initialed the final cease-fire agreement on 23 January 1973; the last American combat troops left Vietnam two months later; and, on 1 April, the final American prisoner of war (POW) returned home.[13] What lessons concerning effects-based operations are present in this painful piece of American history?

The Plans

Unfortunately, Linebacker II did not develop as the result of careful mission analysis tying strategy to specific objectives and supporting tasks with carefully constructed measures of merit and a definable end state. Simply put, there were no other politically or militarily feasible options available.[14] Throughout the near decade of offensive involvement in Vietnam, the United States never adequately translated its political objectives into workable, effective plans of action. Consequently, the history of

military employment leading up to Linebacker II is a curious mixture of tried-and-failed attempts to support nebulous, mutating political objectives.[15] In Kissinger's words, "[T]he American strategy produced what came to be the characteristic feature of the Vietnamese war: military successes that could not be translated into permanent political advantage."[16] By December 1972, the vast majority of American ground forces had returned home; and Nixon faced a Congress poised to "pull the plug" on the entire Vietnamese operation. In fact, Congress did just that on 2 January 1973, when the House Democratic Caucus voted to cut all funds for the war in Vietnam. The Senate followed suit two days later.[17] With the writing on the wall, Nixon was in a corner and Linebacker II was his last opportunity. Frustrations ran high.

After Kissinger's 13 December announcement that talks had stalemated, Nixon spoke the following day with Adm Thomas H. Moorer, chairman of the Joint Chiefs of Staff (CJCS). The president ordered a three-day series of raids against Hanoi beginning 17 December and then, to clarify matters, added, "I fear that in the past our political objectives have not been achieved because of too much caution on the military side. I don't want any more of this crap about the fact that we couldn't hit this target or that one. This is your chance to use military power to win this war, and if you don't, I'll consider you personally responsible."[18]

That same day, operational units in-theater received the first hint of Linebacker II in the form of a message granting authority to "resume tactical photo recce north of 20 degrees North in [North Vietnam] . . . not later than 160500Z." In addition, the Joint Chiefs of Staff (JCS) called for photography of high-threat areas such as Hanoi. The next day, 15 December, the CJCS sent the commanders in chief of Pacific Command and Strategic Air Command (CINCPAC and CINCSAC) an alerting message to prepare for "a three-day maximum effort [of] B-52/TACAIR strikes in the Hanoi and Haiphong areas." The JCS also included a list of 31 targets authorized for the initial strikes.[19] After nearly two months of relative inactivity above the twentieth parallel, the short notice given to commanders made planning difficult and hurried.[20] Consequently, some 12 hours after sending the alert message, the JCS directed a 24-hour delay to improve planning objectives and coordination.[21]

Fortunately, commanders had begun contingency planning several months earlier, as they anticipated operations in the coming monsoon season; however, these plans did not address any specific objectives. In August 1972, CINCPAC asked Eighth Air Force headquarters about SAC's ability to wage an all-weather strategic bombing offensive in North Vietnam using the B-52.[22] This query triggered a planning process that ultimately produced the "Conceptual Targeting Plan for a Coordinated and Sustained Air Campaign against NVN [North Vietnam]," which envisioned a 36-day effort against high-value targets in the North Vietnamese heartland. The plan called for airpower to *first* suppress enemy air defenses and *then* destroy North Vietnam's ability to fight. The B-52's all-weather radar

bombing capability was central to the plan; however, Navy A-6s as well as aid to long-range navigation (LORAN) directed F-4s were also included. Importantly, these means of attack were only useful against *area* targets such as rail yards, airfields, and warehouse storage complexes.[23] The plan was completed in September and sat on the shelf untouched until 15 December.

The president's objectives for Linebacker II were to break North Vietnam's will to resist, demonstrate America's commitment to South Vietnam, and—perhaps most importantly—achieve an agreement permitting US armed forces to disengage before Congress reconvened in January 1973.[24] Nixon believed that anything less than large-scale heavy bomber raids against "the most valuable and lucrative targets in North Vietnam" would "only make the enemy contemptuous."[25] In addition to the B-52's heavy firepower, the president wanted its potential shock effect to signal the intensity with which he intended to pursue the war's conclusion.[26] He wanted maximum psychological impact on the North Vietnamese, and the B-52 was airpower's best tool for the job.[27]

The CJCS transmitted these intentions to the operational CINCs via a 0010 Zulu 17 December execute message:

> You are directed to commence at approximately 1200Z, 18 December 1972, a three-day maximum effort, repeat maximum effort, of B-52 /TACAIR strikes . . . Object is maximum destruction of selected military targets in the vicinity of Hanoi/Haiphong. . . . All B-52 aircraft will carry maximum ordnance loads. . . . Exercise precaution to minimize risk of civilian casualties [by] utilizing LGB [laser-guided bomb] weapons against designated targets (emphasis added).[28]

With these desires in mind, planners designed Linebacker II to inflict the utmost in civilian distress. CJCS Admiral Moorer told SAC commander Gen John C. Meyer, "I want the people of Hanoi to hear the bombs, but minimize damage to the civilian populace."[29]

On 18 December, less than 12 hours before the B-52s began bombing the North Vietnamese capital, President Nixon stated that the purpose of the attacks were "to make clear that Hanoi could not continue to wage war in the South while its territory was immune, and that we would not tolerate an indefinite delay in the negotiations."[30] While political and military leaders hoped physical destruction would generate psychological impacts and force "a return to the tables," the aircrews that would have to execute this operation had far more immediate ideas in mind—like survival.

The Execution

On 18 December 1972, at 1943 hours Hanoi time, the first bombs of Linebacker II began impacting Hoa Lac Airfield, 15 miles west of the capital city.[31] One hundred twenty-nine B-52s, divided into three waves, struck that night with F-111s augmenting. F-4s and A-7s complemented the night strikers with offensive operations throughout the day.[32] The air forces repeated this scenario for two more nights and, though the operators did not yet know it, those first 72 hours constituted Phase I of the

operation. Several hours before the originally envisioned deadline, the JCS notified field commanders to "continue until further notice."[33] In Phase II (21–24 December), single waves of approximately 30 B-52s concentrated on the northeast rail line and, following a 36-hour Christmas stand-down, Phase III began. Postholiday festivities commenced with C-130s and B-52s delivering psychological warfare (PSYWAR) materials such as leaflets, miniature AM radios, and inflation notes (full-size, full-color replicas of North Vietnamese two- and five-dong notes with propaganda attached). In Phase III, airpower continuously bombed authorized targets in Hanoi destroying, for example, the city's power plants. The air attack attempted to isolate Hanoi "geographically, electrically, and logistically" from the rest of North Vietnam.[34] After four days of continued strikes, an unexpected JCS notification terminated all Linebacker II operations at 2359Z on 29 December.[35] Hanoi was ready to talk. Though the massive strikes successfully caused Hanoi to blink, the operation was not without problems.

First, a common end-of-tour critique of the Vietnam experience in general, but Linebacker II in particular, was the lack of unity of command.[36] There was no single unified command in-theater charged with the overall responsibility of directing all US air strikes. There was no unified command structure within the Air Force, much less an equivalent of the present-day joint force air component commander (JFACC) to coordinate actions between services. Seventh Air Force commanded Air Force assets in South Vietnam and deployed Tactical Air Command (TAC) units in Thailand. It also had operational control of Thailand-deployed Thirteenth Air Force units from the Philippines, but it *did not* have control over SAC heavy bombers.[37] While Seventh Air Force tasked and planned fighter and support sorties, B-52 missions received planning inputs from several layers. Headquarters SAC determined the targets and level of effort, subject to JCS approval, as well as the axes of attack and flight routes north of the twentieth parallel. This accounted for approximately two to three hours of the 14-hour mission, leaving the remainder to be planned by the Eighth Air Force staff and individual bomb wings.[38] "Changes in targets or times over targets (TOT) created enormous problems" due to the coordination involved.[39] However, changes were not the only source of trouble and frustration. In several instances, lack of coordination precluded the optimal mix of aircraft and ordnance, resulting in less than desired damage.[40] Further critiquing the lack of a unified aerial command, deputy director of MACV Intelligence Maj Gen Eugene L. Hudson stated, "The existing command structure and its divided responsibilities . . . made a coordinated campaign impossible."[41] Yet, not even proper coordination could solve all the problems of aerial targeting.

Reminiscent of World War II, American aircrews over North Vietnam still had some difficulty simply hitting the target; but problems began even before they released weapons as many never even knew what their target was. In Linebacker II, though the "object [was] maximum destruction" and

no other effects needed to be specified, many mission briefers failed to describe the physical targets but provided only a set of coordinates. Briefers "didn't belabor the point of what the targets were because it didn't make any difference—you were committed and you were going."[42] Unfortunately, in several cases, these nondescript targets were surface-to-air missile (SAM) sites . . . with a longer destructive reach than the aircraft attacking them.[43]

Nor was having the necessary information any guarantee of success, as there were still technological difficulties associated with even striking a target from the air, much less destroying it. As anticipated, weather played a major role. Out of the operation's 12 days, only 12 hours were good enough to permit operators to employ the most precise weapons available—laser-guided bombs (LGB).[44] Barring the ability to employ LGBs or drop visually, fighter-attack aircraft bombed based on position fixes from LORAN equipment. If required, a LORAN-capable F-4 led non-LORAN aircraft to the target and all released their bombs on the F-4's signal.[45] Analyses of targets attacked using LORAN delivery techniques indicated that the spread of bomb craters varied from a low of 100 meters to more than 6,000 meters. On one specific mission in which 12 F-4s and three F-111s attacked a radio communication transmitter, post strike photography revealed no craters or damage within 5,000 meters of the target area.[46]

Along with tremendous payloads, the radar-capable B-52s brought significantly better foul-weather accuracy. However, that accuracy came at a price.

> The stabilization systems for the bombing computers aboard the aircraft required a certain amount of straight and level flight to properly solve the bombing problem; otherwise, the bombs might be scattered outside the target zone. As the missions progressed, and analyses of accuracies could be made, this amount of straight and level flight might be reduced, if circumstances dictated. However, accuracy and assured destruction were overriding considerations. Bombers on the first raids were required to stabilize flight for approximately four minutes prior to bomb release.[47]

Completely aware of their position over the heart of one of the world's best air defense systems, those four minutes must have seemed a lifetime. Indeed, for some they were longer than a lifetime. During the first three days, nine B-52s failed to return from their missions over Hanoi. Given these costs, how did we measure the daily success of the flights that did return and the effectiveness of the operation overall?

The Assessment

Again reminiscent of the 1943 CBO, appraisal of aerial operations relied heavily on comparing prestrike and poststrike photo intelligence.[48] Unfortunately, the same weather that hampered bombing operations also hampered reconnaissance attempts. Postmission critiques such as the following were not uncommon: "The photo recce flight (Mustang) encountered no defensive reaction and had no problems with the exception of the

target weather. They were ineffective due to cloud coverage."[49] Given these problems, many end-of-tour reports cited BDA and the lack thereof as major problems.[50] As it turned out, Vietnam frustrations were not limited to the president and his joint chiefs. As one general noted, "There is always the chance that an aircraft will be lost during combat air operations, but to lose an aircraft and crew while striking a target that has already been destroyed is senseless."[51]

As a result of these difficulties, many aircrews began returning with their own BDA such as "three small secondaries" or "bombs [released] over target." Other crews filed debriefs like "visual drop: crew estimates— good;" and, after examining mission tapes, still other airmen offered feedback as innocuous as "cross hair positioning good." Even when photographic reconnaissance was effective, analysts produced skeletal and generic BDA that provided only a broad description of heavy, moderate, or light damage.[52] In other situations, interpreters could not distinguish Linebacker II damage from that caused by Linebacker I strikes against the same targets; thus, they classified the results as unknown.[53] Therefore, even when photographs were available, the information airmen really needed frequently was not. With this in mind, the following end-of-tour remark is not surprising: "all intelligence sources, analytical formulas, and analysts' judgments have been applied to the BDA problem, but it still remains an enigma."[54]

Though efforts focused on the photographic evidence of physical effects, airmen demonstrated they were aware of functional effects and their temporal nature.[55] According to one analyst, "The military impact of the strikes against storage facilities is significant, but not long range. The enemy can, and has returned to open storage techniques as well as dispersal of critical items."[56] With regard to electrical power facilities, analysts concluded that Linebacker II decreased the maximum power capability of Hanoi and Haiphong from 115,000 kilowatts to less than 30,000, a significant functional effect. This meant only priority users had power, and repairs would take from two months to a year.[57] Similarly, analysts used other technologies, such as infrared photography, to monitor thermal emissions and thereby assess airpower's impact on other industrial functions.[58]

Furthermore, reports such as the *Linebacker II USAF Bombing Survey* repeatedly address psychological effects; however, they rarely justify their claims by explaining their analytical bases. The following excerpts provide a representative example:

- [S]ome BDA was achieved against all of the F-111 targets providing a definite military impact in addition to the *obvious* psychological and harassment effect.[59]
- [T]he massive destruction resulting from the large number of weapons expended against these targets near Hanoi *probably had a very serious* psychological impact on Hanoi's population.[60]

- [A] *significant* psychological impact on the North Vietnamese populace *may have been attained* by the high damage levels as well as the attacks on previously "off limits" targets and areas.[61]
- F-111 strikes during nighttime hours contributed an *immeasurable* psychological effect by harassing nighttime repair efforts.[62]
- *Undoubtedly,* the population suffered a decline in morale as a result of the sheer intensity of the strikes.[63] [Emphasis added in all cases.]

In the end, the survey does acknowledge that the psychological impact of air operations is extremely difficult to measure. Moreover, survey authors seem to anticipate the most crucial question when they conclude, "Despite this obvious decline in morale, there was no evidence indicating that the North Vietnamese leadership could not maintain control of the situation."[64]

Given these diverse discussions on effects, it is instructive to examine how planners assessed Linebacker mission effectiveness. According to one Corona Harvest report:

> An effective sortie was considered as one that (1) released at least 50 percent of its internal or external weapons load in an armed configuration; and (2) at least 80 percent of the released weapons impacted within the target area. During the period of Linebacker II, the latter criterion was difficult if not impossible to use [presumably because of the weather-related lack of BDA]. Thus, an effective sortie was one that released 50 percent of its external or internal load. However, this could mean that a B-52D from U-Tapao would be effective if it released only 12 M-117s of a B/A load of 24 M-117s and 84 Mk-82s.[65]

Hopefully, this after-action commentary was speaking only of assessments in the subtactical world of aircraft maintainers. Unfortunately, at least one end-of-tour report corroborates this theme by sharing: "effectiveness certainly became secondary to the 'bean count' (sorties promised/planned for a given area)."[66] *Bombing Survey* authors at least considered the results of bomb detonations. They wrote, "Perhaps the most valid way to evaluate the bombing effectiveness of a campaign is to compare actual accomplishments against what one might reasonably expect to accomplish given the resources available." Given this statement's broad potential, the survey then—unfortunately—concentrates exclusively on numerical "predicted damage values."[67]

The *Corona Harvest Executive Summary*, also written after the war, takes a much broader view and addresses strategic effects in greater detail than any other document this author found.

> As the bombing of North Vietnam progressed, it became evident that the correlative effects of the attacks—defined as the indirect effects on the enemy, additive to the immediate physical effects of the air strikes—were having a substantial, coercive impact on Hanoi. While the military value of the correlative effects produced by air operations has long been recognized, these effects have usually been considered as "side effects," of secondary importance to more direct military effects. In the air campaign against North Vietnam, however, air operations had political, economic, and strategic impacts which were very important to the attainment of US objectives.[68]

The report goes on to state that, though these effects cannot be quantified precisely, they are apparent from observer testimony (i.e., human

intelligence [HUMINT]) and political countermeasures such as Hanoi's evacuations and internal propaganda campaigns. In order to assess how Linebacker II affected the enemy's economy, the summary attempts to measure the decrease in North Vietnam's gross national product, how much manpower Hanoi devoted to repair efforts, and how dependent the country was becoming on the Soviet Union and China for food imports.[69] The report determines that "the correlative effects [of US air operations] were felt in every segment of the North Vietnamese economy." The study concludes, "Hanoi was able to sustain the war in the South only at a high cost and heavy sacrifice by the people of North Vietnam."[70] What is *not* addressed is how willing Hanoi was to make that sacrifice for the sake of national reunification.

The Feedback and Response

Though the conflict was costly to North Vietnam, it was far from cheap for the United States. During the first three days of Linebacker II, North Vietnamese SAMs downed nine B-52s, severely damaged three others, and took down a single F-111. Six of the heavy bomber losses occurred on night three as an equal number of the 220 SAMs the enemy launched that night found their mark.[71] Nixon, infuriated, "raised holy he– – about the fact that [the B-52s] kept going over the same targets at the same times."[72]

This tactical rigidity was a result of SAC's bureaucratic planning process. Inexperienced in the high-threat environment above Hanoi, airmen experimented with untried tactics on the first night of B-52 strikes. That night went relatively well (only three losses out of 129 sorties), and without changing the plan, there were no losses on the second night. Because of the long lead times between planning and execution, SAC headquarters elected to continue once again with the same attack plan on the third night.[73] However, there was one significant difference—Hanoi was ready.

After six losses that night, many aircrews were outraged by the senseless loss of life and aircraft, while some senior "blue suiters" worried about the continued viability of airpower's strategic doctrine. Meanwhile, the president believed that "a heavy loss of B-52s—America's mightiest war planes—would create the antithesis of the psychological impact [he] desired."[74] Though other planes were lost, B-52s carried special significance. Something had to be done about the SAMs.

As a result, Phase II saw significant changes. Rather than three waves totaling nearly 200 bombers, the second phase employed a single wave of approximately 30 with their target areas shifted away from Hanoi toward other lower-threat regions. F-4Es with cluster bombs augmented the SAM suppression efforts, and some of the B-52s targeted SAM storage facilities.[75] The new tactics seemed to work as only two B-52s failed to return over the next four days. Following the 36-hour Christmas stand-down, Nixon ordered a massive strike on the 26th; and the Air Force responded with 113 B-52s converging on 10 targets around Hanoi and Haiphong

within a single 15-minute window.[76] Over the next few days––until operations terminated on the 29th––packages, routing, tactics, and timing varied daily as a result of the costly lessons learned during the first three days of Linebacker II.

From an effects-based perspective, these changes had nothing to do with proper target selection or destruction of assigned aimpoints. Rather, America's commander in chief perceived the B-52 losses as an extremely powerful psychological counter to the operation's overall objectives and responded accordingly. That response was a strategic choice: operational decision makers had not responded to feedback early enough in the effort. Planning, coordinating, and executing the first three days of B-52 operations left few people and little time to do anything else. Some of the items that fell into that "else" category were assessment of effectiveness, scrutiny of individual losses, and analysis of enemy reactions.[77] North Vietnam forced operational planners to reprioritize these activities when they shot down six bombers on night three.

The Results in Retrospect

From 18 to 29 December 1972, B-52s flew 729 sorties against 34 targets north of the twentieth parallel while delivering 15,237 tons of bombs. In addition, Air Force and Navy fighters combined for approximately 1,200 sorties and another 5,000 tons of ordnance. Targets included rail yards, storage facilities, radio communication equipment, power stations, airfields, SAM sites, and bridges. Targeteers put their highest level of effort against rail yards (36 percent) and focused the least on bridges (less than 1 percent). Regarding functional effects, bombers completely disrupted rail traffic within 10 miles of Hanoi by interdicting 500 cuts in rail lines, destroying nearly 400 pieces of rolling stock, and demolishing 191 storage warehouses. Systemically, strikes reduced POL supplies by 25 percent and electric power generating capacity by 75 percent.[78]

We can qualitatively assess Linebacker II's psychological toll by reviewing the comments of journalists present in the area and the reports of American prisoners interned in the "Hanoi Hilton." Reporters witnessed numerous buses evacuating people to the countryside; and though North Vietnamese leaders had evacuated cities several times previously, this effort was more thorough and, for the first time, people were anxious to leave. Several sources suggest that individuals remaining in town managed to get only one to two hours of sleep a night, and one source reported that workers in the Gia Lam airport wandered around completely disoriented following a bombing strike.[79] Similarly, American POWs witnessed some of the most graphic examples of Linebacker II's psychological impact. Comdr James B. Stockdale, a prisoner for over seven years, believes that "true progress toward victory is . . . simply a direct function of the degree to which enemy 'will' is being subdued." Of Linebacker II, he says

> [W]hen the ground shook, and the plaster fell from the ceiling . . .the guards cowered in the lee of the walls, cheeks so ashen you could detect it even from the light from the fiery sky. . . . The shock was there—the [US] commitment was there—and the enemy's will was broken. You could sense it in every Vietnamese face. They knew they lived through last night, but they also knew that if our forces moved their bomb line over a few thousand yards they wouldn't live through tonight.[80]

NVA Gen Tran Van Tra, commander of Hanoi's forces in South Vietnam, echoed these thoughts when he described the effects of Linebacker II this way: "Our cadres and men were fatigued, we had not had time to make up for our losses, all units were in disarray, there was a lack of manpower, and there were shortages of food and ammunition. . . . The troops were no longer capable of fighting."[81]

The most immediate consequence of these combined effects was Hanoi's 27 December request to resume negotiations. After President Nixon confirmed their willingness to negotiate seriously, he terminated all Linebacker II activity on the 29th. Within a month after US forces ceased bombing above the twentieth parallel, the signing of the Paris Peace Accords signaled the end of American military involvement in Vietnam. Former President Johnson's goal of an independent, non-Communist South Vietnam was achieved––for nearly two and one-half years. With Nixon no longer president and Congress precluding a US military response, Thieu's army proved an insufficient barrier when Giap's divisions crashed across the DMZ in March 1975 and took Saigon the following month.[82]

Summary

Perhaps the following conversation—which took place in Hanoi in April 1975—provides the most accurate, yet succinct, description of the American experience in Vietnam: "You know you never defeated us on the battlefield," said the American colonel. The North Vietnamese colonel pondered this remark a moment. "That may be so," he replied, "but it is also irrelevant."[83] Yet, while this quote accurately describes America's overall Vietnam experience, it fails to capture the success of Operation Linebacker II. In 12 days, American airpower did what the United States had failed to do in the previous eight plus years—extract serious negotiations from the North Vietnamese. Airpower was decisive in this situation. However, it is important to realize that the situation in which America waged war in December 1972 was vastly different than that of 1965 or even 1969. Over the course of the war, America's objectives became much more limited and much more aligned with North Vietnam's—the most important objective being the withdrawal of American troops from Vietnam. By late 1972 North Vietnam was fighting a conventional war, which created entirely new vulnerabilities for them and––for the United States––made previously ineffective targeting plans now viable.

As successful as this 12-day operation was strategically, there were still operational and tactical problems. The lack of a single unified air command structure drastically complicated and, in some cases, precluded effective strike package planning, tasking, and execution. Additionally, precise aerial delivery of munitions was still an issue. Bad weather not only made accuracy more difficult but made assessment of strike results via photo intelligence problematic, if not impossible, in many cases. However, the greater lesson with regard to assessing effects may have been that the most important effects are those most difficult to measure. As a result of its intensity and physical destruction, Linebacker II generated significant political and economic effects, many of which airpower—–or the military for that matter—–were incapable of measuring.

The lessons of Vietnam appeared repeatedly in subsequent decades as the painful memories of Southeast Asia kept resurfacing. However, lessons and memories are very personal concepts, and one person's memories are never exactly those of another. Likewise, every crisis that leads to American intervention is unique, so strategists must tailor accordingly the lessons they choose to apply. On 9 January 1973, the *Washington Star and News* commented that

> the intensive bombing campaign against the Hanoi-Haiphong area in the final two weeks of 1972 may be seen by future leaders as proof that bombing can achieve maximum results at minimal costs. . . . Future presidents will certainly be able to draw the conclusion that bombing can be a "cheap" way of applying heavy military pressure in a very short period of time. Bombing may well appear, as they say, "an attractive option."[84]

American actions in Serbia a quarter century later would reveal this reporter's true prescience and reiterate the lesson that airpower employment should be specially tailored to every situation. Moreover, in the earlier Persian Gulf War, American leaders would apply their Vietnam lessons by working hard to ensure military operations were congruent with other US and coalition efforts as they pursued limited political objectives.

Notes

1. Col Dennis M. Drew and Dr. Donald M. Snow, *The Eagle's Talons: The American Experience at War* (Maxwell Air Force Base [AFB], Ala.: Air University Press, 1988), 262.

2. Ibid., 274.

3. Ibid., 281.

4. Herman L. Gilster, *The Air War in Southeast Asia* (Maxwell AFB, Ala.: Air University Press, 1993), 1.

5. For significantly more on the execution and problems of Operation Rolling Thunder, see Mark Clodfelter, *The Limits of Air Power: The American Bombing of North Vietnam* (New York: Free Press, 1989), 117–46. Also, see Robert A. Pape, *Bombing to Win: Air Power and Coercion in War* (Ithaca, N.Y.: Cornell University Press, 1996), 176–95.

6. Drew and Snow, 295.

7. Clodfelter, 152–53.

8. Earl H. Tilford Jr., *Setup: What the Air Force Did in Vietnam and* Why (Maxwell AFB, Ala.: Air University Press, 1991), 234–37, and Drew and Snow, 315. For more details on Linebacker I, see Clodfelter, 147–76; and Pape, 197–202.

9. Clodfelter, 172; and Tilford, 238.

10. As quoted in Clodfelter, 182.

11. As quoted in Headquarters Pacific Air Force (HQ PACAF), *Corona Harvest*: *USAF Air Operations in Southeast Asia, 1 July 1972–15 August 1973*, vol. 2, IV-208 (Top Secret [TS]). Data extracted unclassified. Air Force Historical Research Agency (AFHRA), K717.0423-23. (Hereinafter cited as *Corona Harvest Air Operations* [*Ops*])

12. Clodfelter, 186.

13. Drew and Snow, 320.

14. "Nixon chose the only weapon he had available." Henry A. Kissinger, *White House Years* (Boston: Little, Brown and Co., 1979), 1461.

15. For an excellent discussion of how the political and military objectives changed and interrelated throughout the Vietnam conflict, see Drew and Snow, 278–301.

16. Raphael Littauer and Norman Uphoff, eds., *The Air War in Indochina* (Boston: Beacon Press, 1972), 3.

17. Clodfelter, 192.

18. Ibid., 190.

19. *Corona Harvest Air Ops*, IV-211.

20. HQ PACAF, *Corona Harvest: The USAF in Southeast Asia, 1954–1973, Executive Summary,* Part II, II-209, (TS). Data extracted unclassified. AFHRA, K717.0423-22. In addition to the short notice, the Air Force was "woefully short of targeting personnel. By 1969, [the] Air Force had just about exhausted its cadre of experienced targeteers fighting the war. The void was filled with 'CBPO' targeteers with little or no experience." See Thomas E. Lee and Samuel M. Taylor, "Air Force Intelligence Enhancement Program," technical note (Washington, D.C.: Bolling AFB/Air Force Intelligence Service, 1985), 4.

21. Maj Calvin R. Johnson, *Project CHECO Southeast Asia Report*: *Linebacker Operations September–December 1972* (S), 31 December 1978. AFHRA, K717.0413-102, C.1.

22. Brig Gen James R. McCarthy and Lt Col George B. Allison, *Linebacker II: A View from the Rock* (Maxwell AFB, Ala.: Airpower Research Institute, 1979), 26–27.

23. *Corona Harvest Air Ops*, IV-21. See also Tilford, 253, and Dana J. Johnson, *Roles and Missions for Conventionally Armed Heavy Bombers—An Historical Perspective,* N-3481-AF (Santa Monica, Calif.: RAND, 1994), 69 (hereinafter cited as RAND).

24. Gen John W. Vogt, commander in chief, Pacific Air Forces, address to the Air Force Association, Honolulu, Hawaii, 15 November 1973, 15 [AFHRA, K168.06-234]; McCarthy and Allison, 40; and Clodfelter, 177–78.

25. Clodfelter, 182.

26. Richard M. Nixon, *The Memoirs of Richard Nixon*, vol. 2 (New York: Warner Books, 1978), 83, 240.

27. Clodfelter, 182; and William W. Momyer, *Airpower in Three Wars* (Washington, D.C.: Government Printing Office [GPO], 1978), 240.

28. *Corona Harvest Air Ops*, IV-213–14.

29. Clodfelter, 184.

30. *Corona Harvest Executive Summary*, II-316.

31. McCarthy and Allison, 1.

32. For a detailed discussion of each of the 11 days' missions, see Maj Karl J. Eschmann, "The Role of Tactical Air Support: Linebacker II," (master's thesis, Air Command and Staff College, Maxwell AFB, Ala. 1985), 55–96. In addition, he includes a list of the specific targets categorized by delivery platform with details concerning the number of sorties fragged against and the total number of bombs delivered towards each target on pages 112–15.

33. *Corona Harvest Air Ops*, 223–25.

34. Ibid., 233–36. For more on the psychological aspect, see Col Benjamin F. Findley Jr., "U.S. and Vietcong Psychological Operations in Vietnam," in *Psychological Operations: Principles and Case Studies* (Maxwell AFB, Ala.: Air University Press, 1996), 233–41.

35. 42d Bombardment Wing History, 1972, vol. 2, supporting documents, message file. AFHRA, K-WG42HI.

36. For two of many, see Maj Gen Jack Bellamy, USAF chief of staff, *End of Tour Report*, 15 August 1974, AFHRA K712.131; and Maj Gen Eugene L. Hudson, operational assistant to HQ 7AF and Deputy Director of Intelligence to HQ MACV, *End of Tour Report,* 20 April 1973, AFHRA, K740.131.

37. Maj Peter A. Costello III, *A Matter of Trust: Close Air Support Apportionment and Allocation for Operational Level Effects* (Maxwell AFB, Ala.: Air University Press, 1997), 19.

38. McCarthy and Allison, 41. See also RAND, 70–72.

39. Bellamy, 12.

40. PACAF (INT), *Lessons Learned Summary*, 9 April 1973, AFHRA, K168.06-233, 13 [Hereinafter cited as *Lessons Learned*]. For specific details, see CHECO, 70.

41. Hudson, 21. MACV is Military Assistance Command, Vietnam.

42. Clodfelter, 186.

43. *Lessons Learned*, 14.

44. CHECO, 61.

45. Gilster, 78.

46. *Lessons Learned*, n.p. One reason offered for the poor performance of LORAN delivery was that the LORAN strikes deep into North Vietnam were made at the fringe of reliable reception in an area where there had been only limited prior reconnaissance to update target coordinates. See CHECO, 44.

47. McCarthy and Allison, 46–47.

48. Headquarters PACAF, *Linebacker II USAF Bombing* Survey, April 1973, AFHRA K143.054-1, vol. 34, 5; *Corona Harvest Executive Summary*, II-252 and 253; and Gilster, 76. Though there were signals intelligence (SIGINT) capabilities available, these focused primarily on the enemy air defense system and, in particular, on locating enemy SAMs.

49. Memorandum from Maj Gen John M. Talbot to Maj Gen Clifford W. Hargrove and Maj Gen Frederick C. Blesse on Linebacker Mission Juliet V, December 1972, AFHRA K740.3391. A Linebacker II India Critique to General Vogt, AFHRA, K168.06-230, likewise noted "the Udorn photo recce flights (Jaguar and Mustang) were unsuccessful due to weather."

50. Three examples can be found in Col Clifford M. Beaton, 7th Director of Operational Intelligence, *End of Tour Report*, 20 July 1972, AFHRA, K740.131; Col Coleman L. Baker, 432 TRW Deputy Commander for Operations, *End of Tour Report*, 14 February 1973, AFHRA, K717.131; and *Lessons Learned*, 15.

51. Bellamy, 13. Specific reference to this type of repeated bombing due to lack of photo recce is given in *Lessons Learned*, 14.

52. Summary of daily briefings of Linebacker II operations, 30 December 1972 (TS), AFHRA, K143.042-12 v.1. In a few cases, there was more, albeit still limited, detail provided as in "tracks [interdicted] at 3 pts." For additional examples, see Linebacker II Juliet Critique, 29 December 1972, AFHRA, K168.06-230.

53. Gilster, 81.

54. Col Burton S. Barrett, 7AF Director of Targets and Deputy Chief of Staff for Intelligence, *End of Tour Report*, 11 June 1972, AFHRA, K740.131. Though this quote refers specifically to operations in Linebacker I, it was still applicable in December as little changed in six months.

55. Though effects may indeed be, and often are, short-lived and transitory, the intent here is not to emphasize the brevity of certain effects but rather to emphasize the broader aspect that time, whether short or long, is a necessary descriptor when considering any effect.

56. *Lessons Learned*, 2.

57. Gilster, 88, and HQ CINCPAC, *CINCPAC Command History*, vol. 1 – 1972, (TS), data extracted unclassified. AFHRA K712.01. For other details, see Hudson, 20.

58. *Corona Harvest Executive Summary*, II-251.

59. *Linebacker II USAF Bombing Survey,* 6.

60. Ibid.

61. Ibid., 10.

62. Ibid., 16.

63. Ibid., 37.

64. Ibid.

65. Quoted in RAND, 76.

66. Baker, 14.

67. *Linebacker II USAF Bombing Survey,* 27.

68. *Corona Harvest Executive Summary*, II-309.

69. For an in-depth look at using North Vietnam's propaganda to measure the coercive effects of airpower in Rolling Thunder, Linebacker, and Linebacker II, see Maj Forrest E. Morgan, "Big Eagle and Little Dragon: Culture and Coercive Uses of Airpower Against North Vietnam" (Unpublished thesis, School of Advanced Airpower Studies, 1994).

70. Ibid., II-309–35.

71. *Corona Harvest Air Ops*, IV-225; and McCarthy and Allison, 83.

72. Quoted in Clodfelter, 187.

73. McCarthy and Allison, 65, 67, 77; and Clodfelter, 186. SAC planners required mission paperwork complete 42 hours before takeoff so they could coordinate it through the multibranched command structure.

74. Clodfelter, 187.

75. CHECO, 59.

76. Clodfelter, 188; and *Corona Harvest Executive Summary*, II-219. Though Clodfelter states it was a strike force of 120 B-52s, Corona Harvest indicates there were 120 scheduled but only 113 actually flew.

77. *Lessons Learned*, 15.

78. Clodfelter, 194–95; *Linebacker II USAF Bombing Survey,* 5–20; CINCPAC Command History, 165; and *Corona Harvest Air Ops*, IV-216. The numbers quoted are taken from Clodfelter. All sources available differed somewhat.

79. *Linebacker II USAF Bombing Survey,* 37; and Clodfelter, 195.

80. Rear Adm James B. Stockdale, address to the Armed Forces Staff College, 9 April 1975, quoted in US Grant Sharp, *Strategy for Defeat: Vietnam in Retrospect* (Novato, Calif.: Presidio Press, 1998), 256–58. For similar experiences from five other POWs, see McCarthy and Allison, 174–75.

81. Quoted in Pape, 204; Phillip B. Davidson, *Vietnam at War* (Novato, Calif.: Presidio Press, 1988), 735–36; and Gen Tran Van Tra, *Vietnam: History of the Bulwark B-2 Theatre, Vol. 5: Concluding the 30 Years War* (Ho Chi Minh City: Van Nghe Publishing Plant, 1982), 6, 33.

82. Clodfelter, 188, 195, 200–202.

83. Summers, 1.

84. *Corona Harvest Executive Summary*, II-226, 227.

Chapter 6

Operation Desert Storm

At its most basic, war is psychological.

—Col Phillip S. Meilinger

The more important something is, the harder it is to measure.

—Lt Col Peter L. Hays

Historical Description

At 0100 local time on 2 August 1990, Iraqi Republican Guard divisions poured across the border and invaded the sovereign nation of Kuwait. Within hours they were in Kuwait City and, by the second day, had reached the Kuwaiti–Saudi Arabian border. On the third day, President George Bush met with the National Security Council to discuss US options; and Gen H. Norman Schwarzkopf, commander of US Central Command (CENTCOM), briefed possible military responses. The plan chosen that day ultimately required nearly six months to deploy all requisite personnel and equipment, depended on using some 25 regional bases, and involved command relationships with military forces from 38 countries.[1]

On 8 August President Bush addressed the world and outlined American objectives for the Persian Gulf region:

(1) Secure the immediate, unconditional, and complete withdrawal of Iraqi forces from Kuwait.
(2) Restore the legitimate government of Kuwait.
(3) Assure the security and stability of the Persian Gulf region.
(4) Protect American lives.[2]

Less than 24-hours prior, American forces had begun deploying to Saudi Arabia, and 17 days later, General Schwarzkopf briefed Gen Colin S. Powell, CJCS, on a four-phased operations concept to accomplish the military portion of the president's objectives. The CENTCOM commander's intent was that "[w]e will initially attack into the Iraqi homeland using airpower to decapitate his leadership, command and control [C^2], and eliminate his ability to reinforce Iraqi ground forces in Kuwait and Southern Iraq. We will then gain undisputed air superiority over Kuwait so that we can subsequently and selectively attack Iraqi ground forces with air power in order to reduce his combat power and destroy reinforcing units."[3]

Powell and the president approved Schwarzkopf's concept; and five months of military preparation ensued producing a detailed plan—Operation Desert Storm. The operations order implementing Desert Storm succinctly listed six theater military objectives: attack Iraqi political/military leadership and C^2; gain and maintain air superiority; sever Iraqi supply lines; destroy chemical, biological, and nuclear capability; destroy Republican Guard forces; and liberate Kuwait City.[4]

The operation would still be a four-phased effort beginning with a strategic air campaign against Iraq. Almost simultaneously, allied air forces would win air supremacy over the Kuwaiti theater. As the operation progressed, airpower would increasingly focus on attriting the Iraqi army to prepare the battlefield for the final phase, an offensive ground operation to liberate Kuwait. The targets of Phase I, the strategic air campaign, included "Iraq's strategic air defenses, aircraft/airfields, strategic chemical, biological, and nuclear capability; leadership targets; command and control systems; Republican Guard Force Command (RGFC) forces; telecommunications facilities; and key elements of the national infrastructure, such as critical LOC between Baghdad and the Kuwaiti theater of operations [KTO], electric grids, petroleum storage, and military production facilities."[5]

As Phase I objectives were met, planners intended Phase II—air supremacy in the KTO—to begin with the "priority of air effort shifting to the KTO to roll back Iraqi air defenses and sever supply lines" in order "to provide an environment in which B-52s, tactical air, and attack helicopters [could] operate effectively in subsequent phases." Then Phase III––battlefield preparation—was to exploit the newly gained air supremacy with increased attacks against Iraqi ground forces and a shift in tactical fires to interdict supply lines and destroy command, control, and communications (C^3) systems in southern Iraq and Kuwait. This would serve to "open a window of opportunity" for Phase IV ground offensive operations to begin and ultimately secure the objectives of liberating Kuwait and destroying the Republican Guard.[6] Lastly, with regard to phasing, the operations plan (OPLAN) stated, "execution . . . is not necessarily discrete or sequential; phases may overlap as resources become available or priorities shift."[7]

At 0238 local time on 17 January 1991, a salvo of Hellfire missiles from Apache helicopters impacted an early-warning radar site in southern Iraq as B-52-launched conventional cruise missiles, naval-fired Tomahawk land-attack missiles (TLAM), and F-117 stealth fighters were already en route to Baghdad.[8] Thirty-eight days later, at 0400 local time on 24 February, the now famous "left hook" of the Phase IV ground offensive began. Total coalition forces in-theater numbered in excess of 660,000. One hundred hours after the ground offensive commenced, the US-led coalition declared a victorious cease-fire on 28 February 1991.[9] Following "the end" of the Gulf War, aircraft supporting Operations Northern and Southern Watch began patrolling the skies to enforce the mandated Iraqi

no-fly zones and, as of this writing, allied air forces still periodically bomb Iraqi air defense sites.[10] Given these events, what effects-based concepts and practices were manifest in the 1991 American air operations over the Persian Gulf?

The Plans

According to then-Lieutenant Colonel Deptula, Lt Gen Buster Glosson's deputy of the highly classified "Black Hole" planners, the Desert Storm offensive air campaign was "an effects-based operational plan." Intentionally shunning a "servicing the target list" approach, planners constantly questioned how to impose force against enemy systems so that every effort contributed directly to achieving coalition political and military objectives. "Assessment of whether to continue or stop attack against a particular system's target set was dependent on achieving the effects desired on the system. . . . If the effects desired were achieved, it did not matter that individual targets may not have been hit."[11] This focus on creating systemic effects rather than destroying individual targets freed assets for strikes against other targets. Initially though, this economy of force was not a by-product of effects-based planning but a driving factor in its implementation.

While top planners had sophisticated effects-based ideas from the outset, traditional destruction-based methodology served as the basis for initial attack planning as early plans to shut down the Iraqi air defense C^2 system reveal. Initially, intelligence identified two major sector operations centers (SOC), and targeteers determined it would require eight F-117s delivering 2,000-pound precision bombs to destroy each of the hardened underground C^2 bunkers. With 16 F-117s available, this 8:1 aircraft to target ratio was acceptable. However, further intelligence analysis revealed not just two SOCs, but four; and associated with each were three to five interceptor operations centers (IOC) and with each IOC a number of radar reporting posts. There were simply not enough F-117s in-theater to destroy each of the newly discovered air defense nodes; however, there were enough to achieve the same *effect*. Planners argued that even if a 2,000-pound bomb did not destroy a bunker, it would cause enough damage to force its occupants to abandon it. If the controllers were not present, the site––though not destroyed––was still inoperative. Thus, using effects-based logic and tasking no more than two F-117s per SOC, the air war opened with 42 F-117s striking 76 targets rather than five.[12]

Further evidence of an effects-based approach to Gulf War planning is shown in the phrasing of various campaign objectives, the layout of tasking documents, and postwar interviews of key commanders. OPLAN Phase I objectives include "*disruption* of Iraqi command and control, *loss of confidence* in the government, significant *degradation* of Iraqi military capabilities, and *isolation* and *destruction* of the RGFC" (emphasis added)[13] Thus, the planners anticipated the ultimate effects of their

actions; and, only in a single instance, was physical destruction their primary goal versus simply an enabling means. One specific target shows this most directly: Iraqi telecommunications. Planners believed that destroying television transmitters, fiber-optic cable repeaters, and the like, and creating a communications vacuum of sorts would help "incapacitate" President Saddam Hussein's regime.[14] The description of Phase II, to "provide a threat free environment allowing unhindered air operations in the Kuwait theater of operations" and "provide an environment conducive to the conduct of air to ground attacks," further demonstrates this effects-based thought.[15] Likewise, the desired effect of Phase III—battlefield preparation—was to reduce Iraqi combat *effectiveness* in the KTO by at least 50 percent.[16]

Additionally, the layout of a new planning tool, the master attack plan (MAP), hints at the emphasis given to effects during early planning for Desert Storm. Planners used the MAP to translate the purpose, mission, objectives, and tasks of the OPLAN into a campaign plan. This tool subdivided each 24-hour plan into groups organized by functional effect or target category. Moreover, in addition to mission number, target, description, and aircraft, earlier versions of the MAP included a category labeled "effects," which—for unexplained reasons—was deleted as planning progressed.[17]

Planners did not explicitly state certain less tangible effects airpower might achieve, but they and decision makers sought them nonetheless.[18] Air operation designers hoped that some of the effects on military-related targets would fuel popular opposition to Saddam Hussein and, indeed, facilitate an overthrow of his regime. What was missing, in addition to explicit statements of this desire, were the exact mechanisms by which this was supposed to occur. According to General Glosson, chief CENTCOM air campaign planner, one purpose behind targeting the telecommunications network was to "make [every Iraqi household] feel they were isolated. I didn't want them to listen to radio stations and know what was happening. I wanted to play with their psyche[s]." Gen Charles A. Horner believed disrupting the electrical system would show the people of Baghdad that the Iraqi president was powerless to counter the US air offensive, and another air strategist thought the message to be, "Hey, your lights will come back on as soon as you get rid of Saddam."[19] The targeting of an insignificant pilot training base near Tikrit serves as a final example. Though "there were no really lucrative targets in downtown Tikrit," planners wanted to "make sure that people in Tikrit knew that war had come to their [hometown]" because Saddam and many of his inner circle came from that area.[20] Thus, planners expected bombing operations to produce bonus psychological effects on the enemy population in addition to its physical effects on the Iraqi war-making capability. However, effects, both physical and psychological, require time to manifest themselves.

General Glosson was distinctly aware of this requirement as evidenced by his comment that once you have taken your action, "the only thing you have to do is have the *patience to wait out the effect of what you've already*

accomplished" (emphasis in original).[21] Nevertheless, being aware of the temporal nature of effects does not mean one can accurately predict *when* those effects will occur. Once planners decided what specific measures to use for defining the "effectiveness" of Iraqi ground forces, the key question became just how long would it take airpower to attrite 50 percent of this. After three months of analysis, the 16 January operation order left the duration of Phase III—battlefield preparation—"to be determined."[22] This open-ended description not only demonstrates the difficulty in predicting the timing of effects but also the flexibility built into the coalition air plan.

This flexibility and awareness of dependence on future information manifested itself in other aspects of the air planning process as well. Sensitive to Von Moltke's warning that "no plan survives first contact with the enemy," General Horner chose not to prepare air tasking orders (ATO) beyond the first two days. Judging the opening hours and days to be critical and the situation beyond that to be "too unpredictable," he reserved the right "to adjust to better intelligence."[23] Though planners created "shells" of subsequent plans, they resisted writing details until seeing results from the first strikes. Soon those results would show the world how devastatingly precise modern airpower had become.

The Execution

The Gulf War opened with more targets in one day's attack plan than the total number of targets the entire Eighth Air Force struck in all of 1942 and 1943. Those 144 strikes constituted more discrete air attacks in 24 hours than in any 24-hour period ever before in the history of warfare.[24] Furthermore, air assets struck 50 of those initial targets in the first 90 minutes of the Desert Storm offensive.[25] Parallel war had taken a giant leap forward. Moreover, the "precision bombing" World War II Eighth Air Force had hoped for was now a reality. With the stealthy F-117, "one bomb, one target" became a reality; and, in some cases, a single aircraft in 1991 achieved the same result with one precision-guided munition (PGM) as having a 1,000-plane raid in World War II with more than 9,000 bombs without the associated collateral damage.[26]

This lethal precision enabled coalition war fighters to achieve systemic effects—air operations against the Iraqi electrical power grid provide a textbook example. In the opening 48 hours, coalition aircraft struck 11 power plants and seven transformer/switching facilities resulting in a 60 percent power reduction in central and southern Iraq. While physical damage was limited, the immediate functional effects were both pervasive and profound.[27] However, while the precise lethality of America's clear-weather LGBs supported effects-based operations in the Gulf, there were other operational factors far less favorable.

"Long live the stovepipe!" could easily have been the battle cry of American forces, and specifically airpower, at the beginning of Desert Storm. Not only did information fail to flow between the operations and intelligence worlds but the knowledge-transfer blockades were firmly in

place between specific sectors within each of those areas as well. While satellites greatly improved imaging and other sensor capabilities, the "green doors" of security over who had "access" precluded many planners and war fighters from seeing very useful intelligence. The "work around" became the day-to-day standard, and formal LOCs withered due to lack of use.[28] This occurred in large part because of the highly compartmentalized nature of producing an air campaign within a specially constructed planning cell, like the Black Hole—with all the secrecy that name implies—rather than relying on established theater organizations.[29] Admittedly––though the Black Hole planners were effective––their closed, secretive nature exacted a toll on overall operations. Initial actions cast the mold for poor communications with the military intelligence community early on. During advance planning, the Black Hole Special Planning Group did not provide Central Command Air Forces (CENTAF) intelligence access to the air operations plan until 18 August, a week *after* the JCS blessed it and made it the de facto CENTCOM air plan. This effectively precluded any CENTAF intelligence input to the planning process.[30] This segregation and secrecy created a "we" versus "they" rift not only between Black Hole planners and theater intelligence but also between Black Hole planners and KTO planners working defensive issues.[31]

Another failure to communicate was highlighted in the inability of the ATO to relay planner intentions to the operators tasked with executing those intentions. Attacks on the Iraqi electrical power grid provided the clearest example of this failure. Civilian authorities implied that military planners should avoid extensively damaging the Iraqi economy and its capacity for postwar recovery. In the electrical power example, this restraint manifested itself at the planning level in choosing to target transformers—which would take months to repair—rather than generator halls, which would require years.[32] However, the ATO failed to communicate such specific guidance and, instead, often simply specified a target such as the Salah Al Din electric plant, leaving unit weapons officers to select specific aimpoints. Accustomed to seeking maximum damage, unit planners often selected the generator hall as the obvious electrical target.[33] Such failures to transmit both the target and the intentions for that target affected not only delivery planning but also the next area as well.

The Assessment

Though combat assessment at the tactical level is a prerequisite for assessing more complex strategic effects, Desert Storm analysts initially were unable to accurately perform even tactical-level assessments. For example, when coalition aircraft struck an intelligence headquarters building, BDA reported the sortie as 25 percent effective because photographs revealed only one-quarter of the building destroyed. What the analysts failed to account for was that the precision bomb effectively shut down intelligence coordination operations from that building. In reality the sortie was completely effective without requiring total obliteration, but analysts

had applied the wrong metric.[34] Perhaps knowing the planners' intentions behind the sortie would have prevented the assessor's mistaken appraisal—perhaps not. Nevertheless, a qualitative assessment of a functional effect was required, and a quantitative evaluation was submitted. This controversy over objective versus subjective and quantitative versus qualitative measurements proved to be an oft-recurring theme throughout Desert Storm.

The difficulty of measuring the effectiveness of Gulf War air operations was seen almost immediately in attempts to quantify the success of Phase II, air superiority. Planners wanted to drive the Iraqi integrated air defense system (IADS) to systemic failure and strikers accomplished this objective quite handily in the first 48 hours, forcing the enemy air defenses to operate autonomously, if at all.[35] The problem lay in confirming the degradation with a level of confidence sufficient to warrant sending nonstealth strikers "downtown." In the end, the JFACC had to rely on circumstantial evidence to make his decision. Based on a drop of more than 90 percent in the activity levels of Iraqi SAM and antiaircraft artillery (AAA) radars, planners elected to send "Package Q"—ultimately the largest of the war— against Baghdad. The plan placed 72 F-16s in the heart of Iraqi defenses; and, once the accompanying F-4G Wild Weasels departed after using their available fuel, the circumstantial evidence proved less than accurate. At one point, participants counted 20 SAMs in the air, with one pilot evading no fewer than six. Many engaged fighters jettisoned fuel tanks and bombs, significantly increasing the likelihood of completely unforeseen collateral damage; and, ultimately, Iraqi guided missiles took down two of Q's fighters. This immediately resulted in a ban on further conventional packages overflying Baghdad.[36] However, this did not solve the problem of assessing the requisite air superiority over the rest of the theater. In the end, assessment defaulted to an after-the-fact confidence. The most conclusive measure of effectiveness eventually turned out to be the coalition's attrition data and the number of friendly aircraft *not* shot down or damaged.[37]

Analysts were also forced to rely on circumstantial evidence to assess the functional effects of strikes on the Iraqi electrical power system. In the coalition's opening strikes, warheads filled with special carbon-fiber wire detonated over switching stations and high-power lines at Iraqi electrical power plants. Though causing massive short circuits, these munitions posed a BDA problem by not producing the visible damage typically seen with traditional explosive munitions. Though planners observed certain functional effects––for example, the lights going out––they were not confident and subsequently targeted many Iraqi power plants with time-honored, explosive, conventional munitions to confirm their successes more directly.[38] Postwar studies revealed that some power plant managers preemptively took their plants off-line in order to preclude damage. While fulfilling functional desires, this *virtual attrition* proved to be the bane of Gulf War air intelligence.[39] Though Deptula received high-level intelligence from Washington the next day (19 January) that both

electricity and water were off in Baghdad, he required another four days without seeing electrical activity before he became convinced.[40] However, even tangible evidence can be misleading.

Poststrike BDA of the Umm al Aish radio-relay facility in Kuwait indicated heavy damage from coalition air during the war. However, postwar examination by an air force ground team revealed that Iraqis had stripped the building of all essential equipment before it was hit. The facility had ceased to function prior to ever being targeted.[41] Similarly, reconnaissance photos of some Iraqi hardened aircraft bunkers (HAB) showed extensive destruction. However, postwar inspection revealed no apparent damage to the shelter's interior despite two direct, but off-center, hits that failed to penetrate. Conversely, the same type LGB penetrators precipitated other unforeseen analysis problems. In some HABs, with clean munitions penetration, there would be extremely little exterior damage beyond a small, neat hole. Observation from many angles might show the bunker intact and undamaged, even though detonation of the penetrating weapon inside had produced a functional kill.[42]

Given that these problems were so common during the "fog of war," objective analysis with numerical indices was not always possible; and General Horner's perceptive comments reflect the need to act based on trends rather than perfect intelligence:

> Bean counters are concerned about holes in runways. They are missing the point. The point is [that] there's no power in Baghdad, no chemical attacks, and their nuclear capability is damaged. We've had [few] aircraft losses. Remember aircraft losses are wins for him. We are going to work on the Republican Guards now. We must keep the pressure on. We know the score is ninety-six to one, but we don't know what inning we're in.[43]

Assessing the outcomes of attacks on the Iraqi ground forces proved even more contentious than those on strategic targets, as the problem of BDA moved into the joint arena.

A specific objective of Phase III, battlefield preparation, was a 50 percent decrease in the effectiveness of the Iraqi army. Aside from the difficulties of physically achieving this objective, arriving at a mutually agreeable means of measuring this effect was practically impossible. The theater Joint Intelligence Center (JIC), Army and Marine components, and the Central Intelligence Agency, each had a different means of estimating Iraqi attrition.[44] These differences were never resolved during the war, and General Schwarzkopf eventually refused to have estimated percentages of equipment destroyed displayed in his briefings. Instead, he opted to have each enemy division color-coded to indicate division effectiveness, as opposed to equipment effectiveness.[45] He then directed CENTCOM JIC to base these collective estimates on equipment attrition, troop desertion rates, and several intangibles in an attempt to evaluate the target sets both objectively and subjectively. As ideal as that sounds, General Horner later pointed out that General Schwarzkopf was more inclined to use the number of air strikes against a unit as his prime

indicator of effectiveness rather than the damage reported.[46] Thus, as indicated earlier with the electrical power grid, commanders often defaulted to tangible indicators (regardless of their appropriateness) to boost their level of confidence.

The Feedback and Response

As previously discussed, General Horner built flexibility into the planning process by refusing to create more than the next two ATOs. This three-day cycle continued for the duration of the conflict. On the first day, planners cast the MAP using current BDA; the ATO was coordinated on the second day, and units executed the plan on the third day. This approach encouraged flexibility, but planners were persistently hindered by a lack of timely BDA.[47] Caused, in large part, by weather and a dearth of the appropriate types of reconnaissance platforms, there was little—if any—feedback regarding the air operation's first-order physical effects, much less their higher-order systemic effects. Without this feedback, the plan continued as originally developed. Later, however, when planners eventually received strike assessments, they were forced to reassess their plan and retarget accordingly.

During the opening hours and days of the campaign, air superiority operations explicitly focused on intimidating Iraqi fighter pilots into believing their chances of surviving against coalition pilots were not high. In retrospect this strategy worked only too well with the Iraqi Air Force requiring little encouragement to hunker down in hardened shelters. This virtual attrition solved the immediate problem concerning control of the air, but the enemy still retained a substantial number of modern combat aircraft. The potential for an air variant of the 1968 Tet offensive loomed large in the minds of coalition planners.[48] Consequently, based on an appraisal of the current Phase II effectiveness, they changed air superiority targeting. Early on, in addition to searching for air-to-air kills, coalition aircraft had been denying Iraq the use of its airfields by cratering runways and covering ramps with area-denial mines. Planners realized this served little purpose if Iraqi fighters were not going to launch anyway.[49] As a result, by the sixth day of the war, planners began targeting the hardened aircraft shelters hiding the bulk of Iraq's combat aircraft. Numerous successes with 2,000-pound laser-guided penetrators triggered a mass evacuation and mad dash of Iraqi jets toward an Iranian sanctuary three days later. This enemy reaction, in turn, prompted coalition air forces to mount continuous interceptor patrols between Iraqi bases and the Iranian border.[50]

Friendly air operations against other aspects of the Iraqi IADS also demonstrated coalition willingness to innovate based on assessments of overall effectiveness. In the case of hardened elements such as operations centers, air planners sought to disrupt their function rather than destroy them. If two or four GBU-27 LGBs "convinced" a given SOC to cease operations, then planners typically did not retarget it unless it subsequently showed operational activity. In at least one case, the SOC in Talil, postwar

inspection revealed that—contrary to earlier assessment—the operations portion had not been penetrated; yet, the controllers inside had still abandoned the facility, providing a just-as-useful virtual attrition. This "functional damage" approach helped conserve the low-density F-117s and precision munitions allowing coalition fliers to prosecute a much wider array of high-priority targets.[51] On the other hand, tales of precision targeting did not always turn out so favorably.

In the early darkness of 13 February, two F-117s struck the Al Firdos bunker with one bomb apiece. Previously, a large number of the identified bunkers that could have served as possible command posts had remained inactive and, therefore, untargeted. By early February, intelligence reports indicated Al Firdos had been activated for use as a command post and, within a week, it made the MAP. Unbeknownst to coalition planners who viewed the structure as a perfectly legitimate military target, the Iraqis were also sheltering civilians on the bunker's top floor. The successful penetration and detonation of LGBs in this bunker generated far-reaching effects—both unforeseen and unpredictable. Iraqi sources claimed 200–300 civilians—including over 100 children—died in the bunker; and Baghdad was quick to exploit the human tragedy. Dramatic television coverage of children's bodies being recovered soon had US media insisting the coalition curtail bombing within Iraqi cities. Consequently, General Schwarzkopf prohibited CENTAF from striking targets in Baghdad without his express approval; and though the Black Hole subsequently tendered a number of requests to hit bridges and leadership targets in the Iraqi capital, approval never came. For all intents and purposes, the strategic air campaign "downtown" was over.[52]

The Results in Retrospect

After a 38-day air offensive and 100 hours of joint operations, the American-led coalition declared a victorious cease-fire. During the 42-day war, nearly 2,800 aircraft conducted 111,500 sorties and burned 824 million US gallons of jet fuel to deliver 140 million pounds of air-to-ground munitions.[53] Given the benefit of nine years of hindsight, what have we learned concerning the effects generated by Operation Desert Storm?[54]

Even if first-order destruction is a primary objective, a living, reacting enemy can make this task difficult, if not impossible. With respect to air superiority, gaining control of the airspace to enable attacks with virtual impunity proved a relatively simple task. Conversely, destroying the Iraqi Air Force did not. Between Iraqi "shell games" with bunkers and surviving planes and a number of successful escapes to Iran, nearly 45 percent of Iraq's aircraft emerged from the war unscathed.[55] Likewise, the "Great Scud Chase" left Saddam's mobile launcher fleet intact and again brought into question coalition (primarily US) BDA capabilities. A Defense Intelligence Agency (DIA) report, written 10 months after the war reveals, "To date, we have yet to confirm an Iraqi mobile short-range ballistic missile (SRBM) launcher kill resulting from US aircraft

attacks." This post conflict revelation contrasts sharply with the roughly 100 Scud launcher kills claimed during the war.[56] As hard as it was to confirm first-order destruction, measuring higher-order systemic effects proved even more difficult.

Assessments, for the president and JCS, of airpower effectiveness against the leadership and C^3 targets defaulted to quantitative presentations showing the percentages of relevant targets destroyed, damaged, and unstruck. Common sense suggests that 850 strikes (480 of which involved 2,000-pound PGMs) must have disrupted the Iraqi government to some extent, and the effects were probably significant. However, without access to detailed information from the Iraqis, the question of exactly how much functional degradation occurred as a result of the aerial attacks could be answered neither during the war nor after. The only known fact is that when the coalition ground offensive began rolling on 24 February, the Iraqi regime was *not* paralyzed.[57]

Equally frustrating from an effects-based standpoint was the apparent lack of higher-order systemic and psychological effects from the attacks on Iraq's electrical power grid. As previously discussed, circumstantial evidence suggests planners achieved their desired systemic effect in shutting down electrical power. Nonetheless, did "turning out the lights in Baghdad" impose observable friction on Iraqi leaders or affect popular attitudes toward Saddam and his regime as planners had hoped? According to information available to the *Gulf War Air Power Survey,* there was no "hard evidence of such cross-category effects."[58] Again, just as Saddam's regime was not paralyzed, neither was it overthrown.[59] In addition to what did not happen, the electrical targeting scheme brought with it unforeseen consequences that did result in public criticism. When Warden developed the strategic air plan, he fully expected the loss of electricity to have a pervasive effect on both military and civilian activities; however, he did not consider its impact on public access to fresh water.[60] Following the conflict, critics blamed this "unnecessary" targeting with a significant number of postwar civilian deaths due to sicknesses resulting from inadequate water purification and sewage treatment.[61]

Before concluding with a retrospective assessment of airpower's effects on the Iraqi army, we need to briefly review the failure to destroy Iraq's nuclear capability, one of the coalition's six stated military objectives. By war's end, the number of nuclear targets had grown from two to eight, of which the DIA assessed five destroyed, two damaged, and one operational. However, just two days after the war ended, the Black Hole received a list of eight other nuclear targets to hit in the event bombing resumed. Furthermore, by October 1991 UN inspection teams uncovered 21 different sites—16 of which were "main facilities"—involved in Iraq's nuclear program. During the war, we simply had no idea of the program's true scope and status. In short, Desert Storm's air attacks no more than "inconvenienced" Iraqi plans to field atomic weapons. The lesson, of

course, is that you cannot target what you do not know exists or what you cannot locate.[62] This problem also plagued planners attempting to identify facilities housing chemical weapons—the Iraqis could store them in "virtually any secure building or bunker," which narrowed the number of possibilities to slightly more than 3,000.[63]

To end on a higher note, airpower was substantially more effective against Iraqi ground forces, though not exactly in the ways anticipated. To review, two of the original air objectives were to sever Iraqi supply lines and decrease the Iraqi army's effectiveness by 50 percent. With regard to interdicting Saddam Hussein's ability to transport supplies to his fielded forces, General Horner summed up his lessons by warning, "Anybody that does a campaign against transportation systems [had] better beware! It looks deceivingly easy. It is a tough nut to crack." Even after successfully targeting selected bridges and chokepoints, the Iraqis proved ingenious at using pontoon bridges, ferries, causeways, alternate routes, and underwater bridges to keep supplies flowing into theater. Though coalition air substantially degraded supply capacities, Iraqi ingenuity and perseverance drove up the opportunity costs of interdiction by requiring near-continuous river and road "recce" to maintain the supply degradation.[64]

Yet, what defines "successful" interdiction?[65] In the end, the Iraqi army had no urgent need for resupply. After achieving their initial objectives in Kuwait, they dug in and stayed put. A static force in a defensive position uses little, if any, POL or ammunition and thus has minimal resupply needs. Even given our best efforts, the Iraqi truck fleet remained "sufficient to resupply the theater."[66] Similarly, analysts believed the amounts of stockpiled diesel fuel to be sufficient for weeks, if not months, of combat.[67] The government was far from decapitated, and communications with Baghdad were almost continuously available.[68] All of this is not to say there were not distribution problems within the theater—there were some frontline units who experienced extreme shortages of food and water.[69] In the larger picture, the Iraqi army was not defeated due to lack of supplies.[70] Nor did physical attrition of Iraqi combat equipment spell defeat for its ground forces. Rather, it was the psychological attrition of its soldiers that finally beat Iraq's army.[71]

Ultimately, the Iraqi army's morale appears to have been the most vulnerable and consequential target of coalition bombing. Repeatedly, POW interrogations revealed that Saddam's troops were overwhelmed by a sense of futility following weeks of sustained bombing. As soldiers became aware of how vulnerable their tanks and equipment were to coalition airpower, they fled their fully functional vehicles—again resulting in virtual attrition. When aerial punishment persisted beyond the anticipated few days to a week, the sustained air supremacy flaunted the coalition's ability to attack with impunity. This insidiously—but pervasively—fostered feelings of futility, hopelessness, and inevitable defeat.[72] Eventually, some 84,000 to 100,000 Iraqi soldiers (25–30 percent)

succumbed to this psychological cancer and deserted.[73] This surprising effect is even more incredible when compared with the mere 10,000 to 12,000 that died of injuries sustained in air attacks. Perhaps Col Philip S. Meilinger is on to something—maybe war, at its most basic, is psychological.[74]

Summary

Events surrounding Desert Storm's opening volley of air strikes suggest that parallel war requires a tremendous amount of intelligence much earlier than does a comparable sequential operation, and it reveals a need for close coordination between operations and intelligence communities. Planners discovered the ATO provided a poor format for relaying their intentions. Yet, even when strikers hit the desired targets in the ways planners intended, commanders often found their analysts capable only of assessing levels of physical damage versus determining how much the attacks had impacted enemy functions. Analysts and planners alike struggled with an inability to confirm effects of nondestructive attacks, and poststrike photos often failed to reveal the destruction caused by PGMs. Lack of timely BDA was a consistent theme throughout the operation; yet commanders insisted on basing their decisions on tangible, objective indicators, rather than relying on subjective indicators or circumstantial evidence.

The coalition's air offensive against Saddam Hussein and his Iraqi military showcased the technological prowess of the American armed forces. In several cases, however, inexpensive countermeasures defied our most sophisticated gadgetry. Ironically, strategic success was often most evident not in physical or even systemic damage but the psychological impacts thereof. Yet these effects defy objective, quantitative analysis, so planners and decision makers were constantly challenged in their efforts to shape and manage the operation. While Desert Storm was extremely successful, the experience challenged certain theories about how to employ airpower for maximum effect. For instance, air strikes succeeded in taking down electrical power in Baghdad in the first minutes of the war, and most of Iraq was blacked out soon afterward. Yet, there is no evidence that "turning out the lights" had any operational impact on the Iraqi military or psychological effect on Iraqi leaders. Moreover, while Desert Storm was the most intense and precise aerial bombardment to date, the outcome fails to confirm assertions that airpower can decapitate a modern state or paralyze its military forces.

Regardless, while there were some problems and deficiencies, overall the successes far outweighed the failures; and in the end, clearly stated political objectives set the stage for congruent, supporting, coordinated military operations.[75] Regrettably, the stage could not have been more different less than a decade later in the Balkans.

Notes

1. Thomas A. Keaney and Eliot A. Cohen, *Revolution in Warfare? Air Power in the Persian Gulf* (Annapolis, Md.: Naval Institute Press, 1995), 1–2; and *Gulf War Air Power Survey (GWAPS),* vol. 1, "Planning" (Washington, D.C.: GPO, 1993), 83–84.

2. Ibid., 22.

3. Briefing slide, "Offensive Campaign: Desert Storm," Headquarters, Central Command, 24 August 1990, *GWAPS,* NA 208. The briefing, as of 15 February 2000, remained classified and excerpted information required declassification. The authors of the *GWAPS* were able to obtain declassification approval for a number of excerpts, which the author of this study was subsequently unable to duplicate. For this reason, GWAPS serves as the reference for this chapter in a large number of instances even though the original source documents are available in the Air Force Historical Research Agency (AFHRA).

4. Keaney and Cohen, 32. The original source document, USCINCCENT OPORD 91-001 for Operation Desert Storm, 16 January 1991, *GWAPS,* NA 357, was destroyed following *GWAPS* completion.

5. *GWAPS,* 5. The original source document, USCINCCENT, US OPLAN Desert Storm, 16 December 1990, *GWAPS,* CHC 18-2, 12, is no longer available at the AFHRA.

6. Ibid., 5–6.

7. Ibid., 4.

8. Keaney and Cohen, 10.

9. Ibid., 21.

10. "US Warplanes Bomb Iraq," *Montgomery Advertiser*, Friday, 11 February 2000, 10A. American planes bombed an Iraqi air defense site in retaliation for antiaircraft gun and missile fire from Mosul, a city 250 miles north of Baghdad.

11. Col David A. Deptula, "Firing for Effect: Change in the Nature of Warfare," *Defense and Airpower Series* (Arlington, Va.: Aerospace Education Foundation, 24 August 1995), 7.

12. Ibid., 6.

13. *GWAPS,* 5.

14. Ibid., 157.

15. Ibid., 11.

16. Ibid., 6. The difficulty of defining this nebulous concept of "effectiveness" is addressed later.

17. Ibid., 13–14. For an example from Deptula's personal combat log, see also *GWAPS,* vol. 2, "Effects and Effectiveness," note 14, 11. The "Execution" section of this chapter discusses the folly of removing this information from the MAP. For more information on the MAP from its creator, see Deptula, note 3.

18. Many of these desired effects do not show up in the specific operations plans and orders, but were clearly stated in *GWAPS* interviews conducted immediately following the Gulf War.

19. *GWAPS,* vol. 1, "Planning," 93, 157.

20. Ibid., 156.

21. Ibid., 171.

22. Ibid., 171–73.

23. Ibid., 187.

24. Deptula, 1; *GWAPS,* vol. 1, "Planning," 189.

25. Ibid., 4.

26. Ibid.

27. *GWAPS,* vol. 2, "Effects and Effectiveness," 294–95, 302–3.

28. *GWAPS,* vol. 1, "Planning," 87, 231.

29. Ibid., 221. According to a CENTAF planner, the cell was dubbed the "Black Hole" because we would send people in, and they would never come out." As quoted in Col Edward C. Mann III, *Thunder and Lightning: Desert Storm and the Airpower Debates* (Maxwell AFB, Ala.: Air University Press, 1995), 46. The Black Hole originated as a very

tightly controlled, select group of planners organized into a Special Studies Division because of the political sensitivities concerning the planning of offensive operations against Iraq. While the Black Hole focused solely on offensive actions, using Warden's Instant Thunder plan as a basis, the theater's formal planning staff, the CENTAF Combat Plans Division, focused on a combined arms campaign for Saudi Arabian defense. This organization, with the Black Hole isolated for operational security, remained in place until mid-December 1990. Approaching the execution phase, Gen Charles Horner reorganized the planning staffs and created the Campaign Plans Division, of which one component was the Guidance, Apportionment, and Targeting (GAT) Division. Within the GAT, which subsequently became known as the Black Hole, the original Black Hole members formed the nucleus of the Iraq Cell, with the old Combat Plans personnel forming the KTO Cell. For significantly more detail on the Black Hole, see *GWAPS*, vol. 1, "Command and Control," 157–204.

30. *GWAPS*, vol. 1, "Command and Control," 157–204. This is not to imply there was *no* intelligence input to the Black Hole, only that what was given came from outside the established CENTAF intelligence community.

31. *GWAPS*, vol. 1, "Command and Control," 229–30.

32. Ibid., 94.

33. *GWAPS*, vol. 2, "Effects and Effectiveness," 294; and idem, vol. 1, "Planning," 117.

34. Col Phillip S. Meilinger, *10 Propositions Regarding Airpower* (Washington, D.C.: Air Force History and Museums Program, 1995), 24–25.

35. *GWAPS*, vol. 2, "Operations," 145.

36. Ibid., 157, 171–77.

37. *GWAPS*, vol. 2, "Effects and Effectiveness," 106, 113, 141.

38. Ibid., 37.

39. This comment should not be misconstrued as stating that virtual attrition is either universally good or bad. In fact, virtual attrition can be seen as either good or bad, depending upon one's position and responsibilities within an effects-based process. For the decision maker, virtual attrition can achieve the exact same results as physical attrition, but at a much lower price. Moreover, it may simplify war termination problems by substantially reducing postconflict reconstruction and its accompanying costs. Conversely, for the assessor, virtual attrition can be a nightmare, as it significantly complicates the assessment process. It removes the emphasis from physical objects, which can be photographed, analyzed, and—if destroyed—forgotten. Instead, it shifts the emphasis to enemy intentions—will the enemy continue not using the equipment or change his mind and subsequently resume using it because it is still fully functional? Moreover, assessors can no longer count targets as destroyed and forget about them. Rather, they must constantly monitor these inactive targets for later enemy use; and this monitoring imposes opportunity costs on surveillance assets, which now may not be available for other missions.

40. *GWAPS*, vol. 2, "Effects and Effectiveness," 303–4.

41. Ibid., 50.

42. *GWAPS*, vol. 2, "Operations," 33–34. Planners eventually realized that video imagery from sensors onboard the delivery aircraft yielded vital (albeit not conclusive) clues that poststrike reconnaissance photographs did not. This discrepancy between onboard sensors and satellite reconnaissance developed into a major issue between theater and national-level BDA estimates before war's end.

43. Ibid., 192.

44. Ibid., 263; and idem, vol. 2, and "Effects and Effectiveness," 209–10.

45. Delineations included less than 50, 50–75, or 75–100 percent effectiveness.

46. *GWAPS,* 210–11; and idem, vol. 1, "Operations," 262.

47. *GWAPS*, vol. 2, "Operations," 160–61.

48. *GWAPS*, vol. 2, "Effects and Effectiveness," 127–28.

49. Ibid., 145–46.

50. Ibid., 129.

51. Ibid., 137.

52. *GWAPS*, vol. 2, "Operations," 206, 220; and idem, vol. 2, "Effects and Effectiveness," 284, 367.

53. Briefing slide, "The Conduct and Performance of the Air Campaign in Operation Desert Storm," 21 March 1991, *GWAPS* , NA 112. The briefing, as of 15 February 2000, remained classified and excerpted information required declassification.

54. At the time of the *GWAPS* 1993 publishing, many questions remained open to dispute concerning the number of enemy tanks, artillery pieces, and other numerical indices of military power that (1) existed prior to the Gulf War's onset and (2) coalition forces destroyed or damaged. This lack of closure, in and of itself, should indicate the difficulty involved even in the most seemingly simple assessments. (See *GWAPS*, vol. 1, "Operations," 1.) In looking for answers, one is tempted to compare the *GWAPS* with the encyclopedic *US Strategic Bombing Survey (USSBS)* of World War II. We must remember that the *USSBS* researchers had significantly greater and earlier access to individual targets, masses of German statistical records and government documents, and interrogations of literally thousands of Germans, including top-level political officials. Conversely, *GWAPS* data came from limited inspections in Kuwait and a portion of southern Iraq and enemy prisoner of war interrogations constrained by repatriation timetables. Virtually no Iraqi records were available and no large-scale open access is expected. (See *GWAPS*, vol. 1, "Effects and Effectiveness," 16.) Consequently, much of the retrospective analysis is still conjecture and open to debate.

55. *GWAPS*, vol. 2, "Effects and Effectiveness," 153–56. However, even after the conflict, Iran did not return many of the Iraqi aircraft that successfully sought refuge across the border. Though the exact number is questionable, these must be counted as physical attrition for the Iraqis even though the actual aircraft were undamaged.

56. *GWAPS*, vol. 2, "Operations," 179, 189.

57. *GWAPS*, vol. 2, "Effects and Effectiveness," 288–89.

58. Ibid., 291–92, 304.

59. Stephen T. Hosmer, *Psychological Effects of U.S. Air Operations in Four Wars 1941–1991* (Santa Monica, Calif.: RAND, 1996), 43–60. Horner provides an insightful look at the psychological effects of air operations against strategic targets in Iraq. He addresses three issues: bombing failed to neutralize Iraqi leadership, Saddam was not overthrown, and there were no popular uprisings.

60. *GWAPS*, vol. 1, "Planning," 117.

61. See *GWAPS*, vol. 2, "Effects and Effectiveness," 305–7, for further details on these accusations and the *GWAPS* response as to why the allegations are invalid.

62. *GWAPS*, vol. 1, "Planning," 225; and idem, vol. 2, "Effects and Effectiveness," 57, 317, 328–30, 343.

63. *GWAPS*, vol. 2, "Operations," 230.

64. *GWAPS*, vol. 2, "Effects and Effectiveness," 188, 192, 200. These *GWAPS* references discuss specific calculations in "tons per day" and how the capacities varied over the course of the conflict.

65. Eduard Mark, *Aerial Interdiction in Three Wars* (Washington, D.C.: Center for Air Force History, 1994); and Maj Scott G. Walker, *Targeting for Effect: Analytical Framework for Counterland Operations* (Maxwell AFB, Ala.: Air University Press, 1998), 29–31.

66. Mark, 184, 192.

67. Ibid., 311.

68. Ibid., 224; and Kenneth M. Pollack, "the influence of Arab Culture on Arab Military Effectiveness" (PhD diss., Massachusetts Institute of Technology, 1996), 548–55. Moreover, as with the earlier question of successfully interdicting a static army, we must also question the *anticipated* success of a strategy aimed at achieving "strategic paralysis" in such a scenario. If the enemy is determined to fight a static, defensive battle of attrition and has no urgent need for resupply, how much contact does that enemy army need with its capital city? Of course, in any wartime scenario, one cannot simply assume the enemy

is determined not to maneuver. Yet, examinations of numerous Arab military operations suggest that Arab military leaders tend to pursue offensive actions for limited gains and then revert to static, defensive operations to consolidate those gains.

69. Mark, 197–200.

70. *GWAPS,* vol. 2, "Effects and Effectiveness," 194, 371. This is not to say the interdiction was inconsequential or that it did not preclude a more lengthy conflict; however, arguments of the "if the ground war had gone beyond 100 hours" variety, regardless of their merit, enter into the realm of the counterfactual and exceed the scope of this study. Historically, armies have proven difficult, if not impossible, to defeat through interdiction alone and more typically are defeated most economically through coordinated joint operations.

71. Ibid., 233–39, 263; and idem, vol. 2, "Operations," 283. As a side note to ground force attrition, the lesson that troops on the move are easier to kill than those dug-in was reiterated several times.

72. *GWAPS,* vol. 2, "Effects and Effectiveness," 225; Group Capt Andrew P. N. Lambert, RAF, *The Psychology of Air Power* (London: Royal United Services Institute for Defense Studies, 1995); Maj John Huss, "Exploiting the Psychological Effects of Airpower: A Guide for the Operational Commander," *Aerospace Power Journal* Winter 1999, 23–32; and Fourth Psychological Operations Group Pamphlet, *Leaflets of the Persian Gulf War,* AFHRA NA-209.

73. Hosmer, 153. Hosmer claims "no fewer than 160,000 (40 percent of those deployed) deserted before G-day." Regardless of actual desertion numbers though, Hosmer presents an excellent look at the psychological effects of coalition air operations against Iraqi deployed forces in his chapter 10, 141–76.

74. Col Phillip S. Meilinger, "Air Strategy: Targeting for Effect," *Aerospace Power Journal,* Winter 1999, 48–61.

75. Jeffrey Record, *Hollow Victory: A Contrary View of the Gulf War* (Washington, D.C.: Brassey's 1993). Record presents a contrary view of the Gulf War.

Chapter 7

Operation Allied Force

We hope that if military action is used, . . . that relatively quickly the Serbs will realize they've made a mistake . . .

—Kenneth H. Bacon, Pentagon spokesman
DOD News Briefing, 23 March 1999

Hope is not a plan, nor a course of action!

—Maj Gen Ron Keys, USAF
USEUCOM J-3 during Operation Allied Force

Introduction

Because Operation Allied Force occurred so recently, the examination conducted in this chapter cannot meet the evidentiary standard set in previous chapters. Analysts are still exploring lessons learned, and the bulk of the story concerning Allied Forces' execution remains classified. Moreover, officers involved in the Kosovo conflict still serve in the military, making it difficult to get objective testimony concerning their actions. Nevertheless, this case offers operational effects-related lessons that this study would be remiss for not including. These lessons point to problems that, if not corrected, portend great difficulties in future effects-based air-power operations. Consequently, Allied Force is an essential part of this study, but to include it was essential to withhold the identity of several sources. Nonetheless, the validity of all information herein was verified through multiple channels.

Historical Description

In February and March 1999, Serbia intensified its protracted campaign to repress its Kosovar–Albanian minority despite numerous attempts by the international community to resolve the issue through diplomacy. Under orders from President Slobodan Milosevic, the Serbian army stepped up its brutal attacks, killing people, burning villages, and creating a flood of refugees—more than 60,000 in a five-week period and an estimated quarter of a million altogether.[1] In order to avert humanitarian disaster and prevent the spread of instability in Europe, US forces, acting in concert with North American Treaty Organization (NATO) allies, commenced air strikes against Serbian military targets just after 2000 GMT on 24 March 1999.[2] Warning that "if President Milosevic will not

make peace, we will limit his ability to make war," US president William J. "Bill" Clinton cited three objectives for the allied strikes:

> First, to demonstrate the seriousness of NATO's opposition to aggression and its support for peace. Second, to deter President Milosevic from continuing and escalating his attacks on helpless civilians by imposing a price for those attacks. And, third, if necessary, to damage Serbia's capacity to wage war against Kosovo in the future by seriously diminishing its military capabilities.[3]

The following day, NATO Secretary-General Dr. Javier Solana echoed the president's second objective as NATO's sole objective—"to halt the violence and to stop further humanitarian catastrophe."[4] To support these political objectives, CJCS Gen Henry H. Shelton succinctly stated NATO's military objective as diminishing "the ability of the Serbian military forces to continue their offensive operations against the people of Kosovo."[5] NATO Supreme Allied Commander in Europe (SACEUR) and commander in chief of US European Command (CINCEUCOM), Gen Wesley K. Clark, was slightly more verbose in his assertion that:

> The military mission is to attack Yugoslav military and security forces and associated facilities with sufficient effect to degrade its capacity to continue repression of the civilian population and to deter its further military actions against his [sic] own people. We aim to put its military and security forces at risk. We are going to systematically and progressively attack, disrupt, degrade, devastate, and ultimately destroy these forces and their facilities and support, unless President Milosevic complies with the demands of the international community. In that respect the operation will be as long and difficult as President Milosevic requires it to be.[6]

Early on President Clinton announced there would be no ground offensive, and he repeated that assurance several times during the crisis. Consequently, the military objectives became, by default, the *air* objectives of Operation Allied Force.

To achieve these objectives, allied airpower first struck the Serbian IADS, C^2 facilities, and infrastructure. Then, in early April, NATO expanded its air operation to include simultaneous attacks on two generic target sets—fixed targets of "unique strategic value" and Serbian fielded forces.[7] On 10 June 1999, 78 days after the first missiles fell, NATO suspended bombing after Serb military leaders signed a military technical agreement that laid out terms for Serb withdrawal and entry of a NATO-led force.[8] President Clinton celebrated this achievement by noting "from the beginning, we had three clear objectives: the withdrawal of Serb forces, the deployment of an international security force with NATO at the core, [and] the return of the Kosovars to their home to live in security and self-government."[9] Ten days later, Dr. Solana officially terminated Operation Allied Force.[10] Given these events as they unfolded, what role did effects-based operations play in this drama?

The Plans

Three issues weighed heavily on the effects-based potential of the Kosovo operation: (1) the lack of a long-term strategy to guide employment

decisions, (2) the initial absence of formal objectives, and (3) conflict within and political intrusions into the targeting process. On 25 March SACEUR General Clark described the opening strikes as "very well planned . . . very well rehearsed . . . [and] the culmination of a long period of planning."[11] Unfortunately, these comments were only true about the opening salvo. Senior commanders initially assumed that no more than two, at the outside three, days of air strikes against approximately 50 Serbian targets would coerce Milosevic into agreeing with NATO demands.[12] Far from simply a military miscalculation, political officials deceived themselves as well. On 23 March Pentagon spokesman Kenneth Bacon confidently asserted, "We have plans for a swift and severe air campaign" and "the United States is not planning to deploy any more planes."[13] Within several weeks, requests for strike aircraft tripled in size.[14] This seems to indicate the United States was shortsighted and underestimated enemy capabilities. Unfortunately, other military problems were equally evident.

Planning efforts, organizational structures, and coordination processes proved inadequate when the conflict extended well beyond the anticipated two to three days. In the words of a prominent Air Force four-star general, the USAFE Combined Air Operations Center (CAOC) experience was that of a "pick-up team with ad hoc training."[15] Commander of allied forces in southern Europe (CINCSOUTH) Adm James O. Ellis's staff shared a similar view of the *short war syndrome*:

> We called this one *absolutely wrong* . . . [It] affected much of what followed: JTF activation, staff composition, facilities, command and control, logistics and execution; lack of coherent campaign planning; lack of adequate component staffing; the race to find suitable targets. . . . [The] OPLAN focused on brief, single-dimension combat . . . We failed to plan for branches and sequels (emphasis in original).[16]

The operation's after-action report to Congress described the initial CAOC as a "hodgepodge of unique systems" and cautioned that, in the future, "such centers cannot be set up from scratch."[17] There was no strategy cell and no GAT process until well after the first month of the conflict.[18] The ultimate impact of this shortsightedness was that no one could develop a consistent targeting strategy during the first half of the operation. Yet, not all of the blame should fall on this one area.

Much of Allied Force's early operational struggle and inefficiency occurred because planners had no formal objectives to focus their actions. Following President Clinton's assurance that there would be no ground offensive, the overall military objectives did become, by default, the *air* objectives. The problem lay in a disconnect between the logical "by default" inference and what actually transpired within the military chain of command. In reality, "objectives were never formally passed to those entrusted with planning the air operations." Moreover, those objectives that were elucidated tended to change regularly. Those officers tasked with defining the combined force air component commander's (CFACC)

strategy-to-task plan for achieving higher headquarters (HHQ) objectives did not have a definitive statement of that HHQ's mission, intent, and objectives and, consequently, were unable to plan a coherent campaign. This was especially true with respect to associating specific targets and target sets with CFACC tasks.[19] Other hurdles hindered effective targeting as well.

Target selection and targeting approval became two of the alliance's greatest challenges. First, CFACC Lt Gen Michael Short and SACEUR General Clark disagreed throughout on the basic targeting scheme as far as the weight of effort devoted towards bombing for strategic effects versus attacking Serbian fielded forces.[20] Beyond this, alliance politics and concerns for collateral damage played a tremendous role. The 18-nation North Atlantic Council had to give unanimous authorization to strike each category of target, and targets in certain categories required individual approval by leaders in Washington, Paris, and London. General Clark vetted every target and, initially, the ordnance used against them; yet, political leaders frequently rejected even those targets the theater CINC personally chose.[21] Such political rejections did not always occur early in the process as one or two nations could veto a target literally up until moments before ordnance release. More than once this caused air commanders to recall packages already airborne and en route to their assigned targets.[22] Acting in concert, the shortsighted planning, lack of objectives, target selection conflict, and collateral damage concerns made it impossible to execute a coherent, coordinated, and integrated air strategy. Consequently, effects-based operations at the operational and strategic levels of war were largely a moot point.

The Execution

Recalling the targeting tension between SACEUR and CFACC and this chapter's epigraphic thoughts on "hope," the execution of Allied Force seemed to *hope* for the success of a more sophisticated strategy aimed at creating strategic effects by striking key targets but *rely* on a classic attrition strategy. Jamie Shea provides the clearest evidence of this dichotomy in a 4 May NATO press conference.

> [W]e are able to turn off and on the light switch in Belgrade, and *hopefully* also thereby to turn the lights on . . . in the heads and minds of the Belgrade leadership as they realize that they have no option but to meet the essential demands of the international community (emphasis added).

> And now our emphasis . . . will be on grinding the forces down in the field in Kosovo until such time as they realize that they have no option but to depart.[23]

Within this strategy, NATO commanders demonstrated their understanding of the need to create functional effects when they made statements such as "a tank stuck in its tracks because it has no fuel is far less of a tank" and "a command-and-control network [with] no [electrical] power means no runway lights, no computers, [and] no secure communications."[24]

However, efforts to apply this knowledge faced quite an uphill struggle through the fog and friction created by ad hoc organizations plagued with internal communication gaps and lack of clear direction.

In the end, "this was not an objectives-based war."[25] In one specific example, planners targeted the enemy command, control, communications, computer, and intelligence (C⁴I) network for take down, anticipating such a strike would decrease enemy capability for six to 12 hours. However, they planned no follow-on actions to exploit this brief period of vulnerability. In essence, they had decided to destroy select facilities within the network simply because they were C⁴I related. They had not considered what specific effects they wanted or how those effects might contribute to a larger plan.[26]

When considering the entire military effort, not to mention the political interactions, the term *effects-based operations* does not accurately describe the actions planners took during Allied Force. Nevertheless, the conflict did provide a showcase for improvements in US intelligence operations that have potential for supporting future effects-based efforts. One of these was the Joint Warfighting Analysis Center (JWAC) based in Dahlgren, Virginia.[27]

Established in May 1994, the JWAC is a conglomerate of military personnel, engineers, and scientists who provide effects-based precision targeting options for selected networks and nodes of designated regions or countries.[28] As capabilities for precisely employing force have evolved, so has the need for precise intelligence and targeting analysis. The JWAC is attempting to fill that need by coupling multisource intelligence and imagery with human and computer-aided analysis to generate intelligence on the material basis of an enemy's war effort. The four main core competencies of JWAC's analytical efforts—electrical power (EP), POL, LOC, and telecommunications (TELECOM)—focus on infrastructure networks. To these, the JWAC is adding three other competencies (critical industries, commodities, and military logistics) with the goal being to consider these seven areas as an integrated whole. Upon tasking by a supported CINC, the JWAC assesses the designated state, region, or group for potential targets within the seven areas of analysis. Then the JWAC evaluates these prospective targets in terms of potential effects on the state's elements of national power: military, political, economic, and social.[29] In addition to providing planning support to the combatant commands, functional components, and the joint staff, the JWAC assists in developing battle damage indicators (BDI) and conducting combat assessments to include BDA and reattack recommendations on infrastructure networks.[30] Therefore, the JWAC is involved throughout the planning and execution phases of an air operation. As ideal as that sounds, however, the JWAC could not provide all of Allied Force's assessment needs. By virtue of the core competencies comprising JWAC's analytical efforts, it should be obvious that such detailed analysis requires significant forethought and study prior to employment. In fact, such effects-based analysis of Serbia did take place

in mid-1998; however, once briefed to NATO, "it was less than warmly received," much like the earlier comprehensive, long-term air strategies that were never approved.[31]

As prestrike analysis had its difficulties, so too did poststrike assessment. Recalling the C^{4}I attacks, if planners simply wanted to destroy targets, then they could measure their results easily enough via overhead imagery and cockpit video. Higher-order effects, however, required other means of appraisal.

The Assessment

By and large, appraising effects and effectiveness falls under a category labeled operational assessment (OA). On day three of the conflict, the 32d Air Operations Squadron (AOS), Ramstein Air Base (AB), Germany, was tasked to provide daily mission results to the United States Air Force in Europe (USAFE) Director of Operations and USAF air campaign planners on B-52 conventional air-launched cruise missile (CALCM), F-117, and B-2 strikes.[32] Ill-equipped for the assignment, the squadron could only allocate a few people; and those tasked had no connections with any of the participating organizations such as the CAOC, Joint Task Force (JTF) Noble Anvil, or any of the air wings. As the conflict extended well beyond the originally anticipated two to three days and the scope of the assessment mission expanded likewise, the small contingent became overwhelmed. On day 11, senior USAFE leaders apparently realized the scope of their assessment request and tasked the warrior preparation center (WPC) to collect data and provide analysis on the air campaign. This second tasking did a much better job of aligning requirements with capabilities. The WPC could supply significantly more people to the job and—in fact—simply replace the vast majority of original analysts, who then returned to other taskings. Upon arrival at the 32d AOS, the WPC team discovered no mechanism or tool in place to either collect or analyze the necessary data. "Although there were numerous spreadsheets and briefings, no comprehensive, real-time system existed to capture data and then perform analysis."[33] With sufficient numbers of personnel and the proper hardware and software now present, operational assessment significantly improved.[34] However, once again, lack of operational and strategic objectives complicated any OA usefulness. Without stated objectives, there was nothing against which to assess any results.[35] While most of the operational assessment team (OAT) remained at Ramstein AB, a small, two-person element forward-deployed to Italy on 17 April. Upon arrival, it too found itself in a completely unfamiliar situation as the Vicenza CAOC had never before used an OAT. The OAT forward found "no plan, no strategy, no operational assessment in place, no feedback loop to the CFACC, [and] no data gathered." In short, operational assessment had been grossly overlooked in the beginning of Operation Allied Force.[36]

Once assessment was under way, two topics with effects assessment implications came up repeatedly—allied air superiority against the

Serbian air defense system and the morale of enemy ground troops. The air superiority issue revolved around disagreements between planners about exactly what allied commanders wanted to achieve. Most believed allied airpower leaders simply wanted the ability to conduct air operations "without prohibitive interference by the opposing force."[37] If that was the objective, then NATO aircraft achieved this capability within the first month of combat, and ultra-low allied loss rates confirmed that accomplishment.[38] This freed strike aircraft to destroy other key targets but repeatedly charged an opportunity cost in terms of suppression of enemy air defense (SEAD) assets. Regardless of Serbian IADS inactivity, allied forces still had to maintain protective SEAD assets in place because even though Yugoslav air defenses may not have been active, they were not dead either.[39] Consequently, other planners, such as those on Admiral Ellis's staff, maintained that allied leaders wanted to decimate Serbian air defenses. However, NATO's ability to do that depended heavily on the enemy's willingness to engage; and "after 78 days of hard campaigning, we [had] affected little degradation on a modern IADS system [with] redundant systems and well-trained operators with the discipline to wait for a better opportunity."[40] Ultimately, though, most planners concede that airpower did achieve what it set out to do in the area of air superiority. GAT team chief Lt Col Patrick Shaw asserts, "One of the CFACC objectives was to 'Enable' air operations. We didn't seek to destroy the IADS, just to make it unable to prevent us from doing other things."[41] This position is consistent with the decision air leaders made early in the conflict to operate at altitudes negating most Serbian antiaircraft systems, thus enabling allied aircraft to attack with virtual impunity. Yet, as the CINCSOUTH staff comments indicate, the air superiority objective was either not completely agreed upon or not completely understood by all involved.

The second area that challenged the allies' effects assessment capabilities was measuring the morale of enemy ground troops. Allied leaders devoted considerable effort to physical and psychological operations aimed at achieving enemy demoralization. Heavy bombers targeting ground formations with substantial numbers of dumb bombs created great physical and, hopefully, psychological effects, while the more formal psychological operations (PSYOP) consisted of leaflet deliveries and television and radio broadcasts. MC-130H Talon IIs and F-16 Vipers disseminated over 100 million leaflets with 37 different messages over 82 Serbian target areas, while the EC-130E Commando broadcast over 1,300 hours of radio and television messages.[42] Throughout the campaign, analysts measured the effects of these operations via troop desertion rates and the increasing numbers of Yugoslavs evading reserve call-ups.[43] In one briefing, Rear Adm Thomas R. Wilson, J-2, director of Joint Staff intelligence, cited a report of 300-plus deserters in a single day but cautioned that assessment must focus on the trend and not the number.[44] Unfortunately, CAOC planners often had neither the numbers nor the trends. Though the author was unable to determine which analysts measured morale effects,

it was not the CAOC operational assessment team. CAOC planners were unaware of this demoralization objective, much less any developed measures of effectiveness, and they received their first feedback on this portion of the operation from televised press conferences.[45] Again, the lack of formal objectives combined with an ad hoc organizational structure greatly nullified the effects-based potential of Operation Allied Force.

The Feedback and Response

The inability to get timely BDA was a problem. As BDA is a subset and, therefore, precursor of combat assessment (CA), this problem had significant impacts on the feedback and retargeting process. Much of the difficulty arose because there was no single point of assessment authority designated, and—over time—several agencies began offering their own versions of assessment without coordinating with each other. JTF Noble Anvil provided a high-level thermometerlike assessment (red-yellow-green sliding scale), while the CAOC operational assessment team conducted more detailed assessments looking at individual missions, bombs, and impact points.[46] Phase I (physical) BDA came from the OAT and often the GAT team itself.[47] The CAOC generally received Phase II (functional) BDA after approximately a week, which was too late for GAT use. Likewise, Phase III (systemic) BDA, when available, also arrived too late for the GAT to use; and the strategy cell never saw any at all.[48] The GAT team made a concerted effort to avoid making rubble bounce and, accordingly, created two categories for questionable targets. The team affixed the label "GAT hold" to targets on which they were awaiting further BDA, while "revalidate" described targets they deemed unnecessary to meet CFACC objectives and, subsequently, were returned to the tasking agency. A third category, "effects achieved," designated targets that had been struck, with self-explanatory results. By war's end, the GAT team had few appropriate targets remaining. However, as the end approached, the number of revalidates grew as various agencies came under pressure from SACEUR to produce targets. General Clark directed that 2,000 targets (or T2K, as insiders called them) be made available. There was no reason for the number given, and, apparently, it was arbitrarily chosen without regard for specific effects.[49]

An inability to get accurate BDA was also a problem. In one situation, BDA reports listed a critical target as having only "light damage." Knowing the target had been struck a week prior, a planner retrieved the associated cockpit video and watched as two GBU-27 LGBs penetrated the target leaving only two small holes with smoke billowing out of them. The planner elected not to restrike the target.[50] In another case, the objective had been to "destroy" a certain building. When post strike photography revealed one and one-half walls still standing, the analyst sent the target back up to be restruck—so much for functional kills.[51]

Due to allied leaders' short-war mentality, the need for a GAT process was initially overlooked. Even when such a requirement was recognized,

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developing a team with an effective process and integrating that process into CAOC operations required time. Once the GAT process was under way in the final month of the conflict, the team attempted to strike only those targets necessary to achieve a specific CFACC objective or task. They also tried to determine what was required to achieve the desired effect on each particular target. Unfortunately, that type of analysis was often impossible because many of the agencies nominating targets typically had no specific effects in mind when they selected those targets.[52] More often than not, targets were nominated simply "because the target may have had some military significance at one time or another." These effects-irrelevant nominations were largely an attempt to fill Clark's T2K directive. Due to lack of support, the GAT team ended up doing a lot of this analysis, but found itself improperly equipped for the task.[53]

Operation Allied Force did provide airpower operators an opportunity to employ some innovative new concepts such as using real-time reconnaissance imagery to detect mobile targets and "flex" already-airborne assets against them. However, given the operational and strategic problems discussed earlier, that is, conflicting guidance and lack of a long-term strategy, not to mention complete absence of a GAT process or operational assessment team early on, the overall value of this new tactical capability as employed in this operation is questionable. Who, using what guidance, determined whether a "flex" target, even if militarily significant, was (1) aligned with CFACC priorities and intentions, and (2) more or less valuable than the target originally assigned? Unfortunately, because this operation occurred so recently, little of the operational experience describing this tactic has been recorded in an unclassified format. Consequently, these questions cannot be answered in this study. What can be said, however, is that these types of doctrinal questions needed to be addressed before the associated tactics were employed, and they were not.

The Results in Retrospect

Allied Force was a remarkable operation in several respects. Over a 78-day period, NATO allies flew over 38,000 sorties (14,000 strike and 24,000 support) and delivered over 28,000 munitions on more than 9,800 separate aim points, of which 75 percent suffered moderate to severe damage. Even with this level of activity, there were less than 20 incidents of collateral damage; and NATO experienced an unprecedented zero combat casualties, while suffering only two aircraft losses.[54]

Overall though, these results allude to two important lessons. First, airpower is an extremely powerful tool even when shackled with all of the employment problems discussed previously. Second, despite this impressive capability, substantial operational and strategic shortcomings persist. Numerous examples continue to demonstrate that, regardless of our desire for quantified solutions, numbers do not answer our most important questions. At the operational level, for instance, our ability to achieve air superiority appears amazingly impressive from a numerical standpoint.

Even though less than 10 percent of the strike missions targeted the Serbian air defense system, the resultant effect was a friendly aircraft loss rate of less than 0.1 percent.[55] The problem, again, lies in the opportunity cost imposed by an IADS that is inactive rather than destroyed. This issue is magnified further when viewed in the context of President Clinton's original objectives for Operation Allied Force. On 24 March 1999, his third objective was "to damage Serbia's capacity to wage war against Kosovo in the future by seriously diminishing its military capabilities."[56] If you consider the Serb air defense system to be a component of future military capabilities, then virtual attrition hardly suffices to achieve the president's objective. Another example that demonstrates the frequent irrelevance of impressive numbers to important questions lies in the targeting of the Serb electrical system. While only two-tenths of 1 percent of all targets struck were electrical power facilities, these few strikes effectively denied electricity to 85 percent of Serbia.[57] The broader point of contention, however, is that we still do not know how or even whether the loss of electrical power influenced Milosevic into capitulating.

In the end, these broader effects-related questions are the most troubling because answering them so often requires cooperation from our vanquished foes. As Schelling said, a coercive strategy works primarily in the mind of the enemy. Consequently, while it may be possible to modify adversary behavior, rarely do we know what psychological influences triggered the change. In retrospect, from a strategic perspective, we still cannot definitively state what caused Milosevic to capitulate––whether it was Russia's threatened withdrawal of support, the Kosovo Liberation Army's actions as a surrogate ground force, Clark's targeting the Serbian fielded forces, Short's strikes against targets of "unique strategic value," or some aggregate of all these things. Perhaps, Milosevic had simply achieved his objectives.[58] Without the Serb president explicitly telling us why he yielded when he did, we simply do not know for sure. Ultimately, we can only be sure of one thing: NATO did achieve its principal military objective of a Serbian withdrawal from Kosovo; however, it was not able to halt ethnic cleansing before it was essentially complete. Perhaps airpower, even with all its capabilities, was not the instrument of choice to generate this specific effect.[59]

Summary

Although NATO finally achieved capitulation and victory, there were significant problems in Kosovo other than those perpetuated by Milosevic. From having only a two-day plan on the shelf, to prolonged conflict between the SACEUR and CFACC over targeting plans, to objectives written after the fact, there appears to have been no strategy—much less a coherent one—guiding the initial execution of this air operation. Admittedly, during the second half of the conflict—after the strategy cell *found* some objectives—operational assessment had begun and the GAT

process was under way, the CAOC's operational efficiency and effective-ness improved considerably. In the main, however, any consideration of effects-based targeting at the strategic and operational levels was, at best, an afterthought. Yet, even given these criticisms, Operation Allied Force was a success; and there were a number of high points besides Milosevic's eventual capitulation. During 78 days of operations, NATO conducted more than 38,000 sorties with zero friendly combat casualties.[60] Demonstrating post–Desert Storm improvements in lethal precision, vir-tually all air-to-ground strikers had some precision capability; and the B-2 with the joint direct attack munition (JDAM) demonstrated that weather was no longer an inhibitor. On balance though, without a clear strategy and specific, predefined objectives with well thought through measures of effectiveness, effects-based operations was simply a pleasant phrase implying an operational coherence not truly present.

Notes

1. President William J. Clinton, televised national address, 24 March 1999, n.p., on-line, Internet, 22 February 2000, available from http://www.pub.whitehouse.gov/uri-res/I2R?urn:pdi://oma.eop.gov.us/1999/3/24/5.text.1.

2. Secretary of Defense William S. Cohen, DOD news briefing, 24 March 1999, n.p., on-line, Internet, 22 February 2000, available from http://www.defenselink.mil/news/Mar1999/t03241999_t0324sd.html.

3. Clinton.

4. NATO Secretary General Dr. Javier Solana, press conference, 25 March 1999, n.p., on-line, Internet, 22 February 2000, available from http://www.eucom.mil/operations/af/nato/1999/march/99mar25.htm. For a greater look at the widely differing US and European objectives, see Dick Diamond, "Kosovo Lessons Learned Study Group Final Report," Raytheon Systems Company PowerPoint briefing, 27 July 1999, slide 5.

5. Chairman of the Joint Chiefs of Staff Gen Henry Shelton, DOD news briefing, n.p., 24 March 1999, on-line, Internet, 22 February 2000, available from http://www.defenselink.mil/news/Mar1999/t03241999_t0324sd.html.

6. NATO Supreme Allied Commander in Europe and commander in chief of US European Command, Gen Wesley Clark, NATO press conference, n.p., 25 March 1999; on-line, Internet, 22 February 2000, available from http://www.eucom.mil/operations/af/nato/1999/march/99mar25.htm.

7. The targets of "unique strategic value" included national command and control facil-ities; infrastructure such as bridges, POL production, and communications and, later, Serbia's electrical power grid. See Rebecca Grant, "Airpower Made It Work," *Air Force Magazine* 82, no. 11 (November 1999): 30–37. See also "General Clark on NATO's Air Campaign," n.p., 28 May 1999, on-line, Internet, 22 February 2000, available from http://www.eucom.mil/operations/af/usis/99may28.htm; and Gen Wesley K. Clark, press conference on the Kosovo strike assessment, 16 September 1999, n.p., on-line, Internet, 22 February 2000, available from http://www.eucom.mil/operations/af/nato/1999/meabriefing.htm.

8. DOD News Briefing with Secretary Cohen and USD Slocombe, 9 June 1999, n.p., on-line, Internet, 22 February 2000, available from http://www.defenselink.mil/news/June1999/t06091999_t0609kos.html.

9. Interestingly, though, President Clinton did cite three objectives on 24 March, the clarity of which are debatable––they were NOT the same three, now-clear, objectives cited on 10 June. President Clinton, televised national address, 10 June 1999, n.p., on-line,

Internet, 22 February 2000, available from http://www.pub.whitehouse.gov/uri-res/ I2R?urn:pdi://oma.eop.gov.us/1999/6/ 10/7.text.1. Additionally, see the North Atlantic Council statement of goals dated 12 April 1999 (19 days after strikes began), n.p., on-line, Internet, 22 February 2000, available from http://www.defenselink.mil/specials/kosovo.

10. "Operation Allied Force," on-line, Internet, 22 February 2000, available from http://www.eucom.mil/operations/af/index.htm.

11. Clark, NATO press conference, 25 March 1999.

12. Grant, 30. See also the comments of Air Vice Marshal (AVM) Mason and General Jumper in "Operation Allied Force: Strategy, Execution, Implications," *An Eaker Colloquy on Aerospace Strategy, Requirements, and Forces*, Ronald Reagan International Trade Center, Washington, D.C., 16 August 1999, 3, 11, on-line, Internet, 26 February 2000, available from http://www.aef.org/eak16aug99.html. The senior leadership's short-war mentality may have been caused, at least in part, by overly optimistic lessons derived from the 15-day Operation Deliberate Force less than four years earlier. Still, there *were* other plans developed, which outlined a comprehensive, long-term, phased air strategy; however, these were never accepted at the highest levels of USEUCOM and SHAPE. From personal interview with Lt Col L. T. Wight, USAF, Operation Allied Force C-5 Strategy Cell, 7 March 2000.

13. Kenneth H. Bacon, DOD news briefing, 23 March 1999, n.p., on-line, Internet, 22 February 2000, available from http://www.defenselink.mil/news/Mar1999/t03231999_ t0323asd.html.

14. Grant, 36. See also the comments of AVM Mason in the *Eaker Colloquy,* 3.

15. The general's name is withheld to comply with Air University's policy of nonattribution.

16. Draft briefing prepared for commander in chief, US Naval Forces, Europe; Commander, Allied Forces Southern Europe; and Commander, Joint Task Force NOBLE ANVIL, Adm James O. Ellis, USN. Following Operation Allied Force, Admiral Ellis's London-based staff drafted an extremely candid after-action PowerPoint briefing titled "A View from the Top," from which these quotes are taken. After the draft was created, E-mail facilitated its widespread, but unauthorized, distribution. Though his staff did not disavow the contents, Admiral Ellis declined to personally deliver the briefing following its premature proliferation.

17. Kosovo/Operation Allied Force After-Action Report, Report to Congress, 31 January 2000, 45, 49–50.

18. Wight, 7 March 2000.

19. Lt Col Patrick Shaw, USAF, Operation Allied Force Guidance, Apportionment and Targeting (GAT) team chief, interviewed by author, 28 March 2000. The vast majority of information on this subject remains classified; however, numerous Allied Force participants have corroborated these statements. In fact, comments such as, "there was no strategy, goals, objectives, tasks until much later in the war" came up in *every* interview the author conducted.

20. John A. Tirpak, "Short's View of the Air Campaign," *Air Force Magazine*, September 1999, 9, 43–47. Also, see Linda D. Kozaryn, "Air Chief's Kosovo Lesson: Go for Snake's Head First," American Forces Press Service news article, 21 October 1999, n.p., on-line, Internet, 24 February 2000, available from http://www.defenselink.mil/news/Oct1999/n10261999_ 9910264.html.

21. Karl Mueller, "*Deus Ex Machina*? Coercive Air Power in Bosnia and Kosovo," study presented at the program on International Security Policy, University of Chicago, Chicago, Ill., 16 November 1999. See also Grant, 33; Tirpak, 47; and report to Congress, 16. Of the 19 nations, only 13 had forces present and most acquiesced to whatever was agreed upon. In reality, after the United States nominated a target, "France, Germany, the UK, and Italy were the real NAC target approval team." Shaw, 28 March 2000. Lastly, though political leaders often rejected targets due to concerns about collateral damage, there were cases where independent economic considerations also influenced the target approval process.

22. Grant, 35.

23. Jamie Shea, NATO spokesman, NATO news backgrounder, 4 May 1999; on-line, Internet, 22 February 2000, available from http://www.eucom.mil/operations/af/nato/1999/may/99may04.htm.

24. Jamie Shea, NATO spokesman, NATO news backgrounder, 3 May 1999, n.p., on-line, Internet, 22 February 2000, available from http://www.eucom.mil/operations/af/nato/1999/may/99may03a.htm.

25. From a Navy commander who must remain anonymous but had confirmed access to the highest-level military video teleconferences during Operation Allied Force.

26. Though only a single example, this is representative of many discussed in several briefings given to the School of Advanced Airpower Studies (SAAS) between September and December 1999. Specific sources are withheld due to the school's stated policy of nonattribution; however, details have been corroborated by multiple individuals with access to the highest levels of planning and execution.

27. Discussing the vast majority of the JWAC's capabilities requires classified access. Likewise, discussion of specific support provided by JWAC during Operation Allied Force is beyond the classification of this paper. Therefore, what follows is an extremely brief and skeletal look at the JWAC's generic capabilities. The author's intent is simply to ensure the reader is aware of the JWAC's existence and the role the DOD intends it to play.

28. Joint Warfare Analysis Center home page, n.p., n.d., on-line, Internet, 7 April 2000, available from http://www.jwac.ic.gov.

29. Maj Jay M. Kreighbaum, "Force Application Planning: A Systems-and-Effects-Based Approach," (Unpublished thesis, SAAS, 1998), 38–39.

30. JWAC home page.

31. Col Kevin Kenkel, USAF, Operation Allied Force Operational Assessment team chief, interviewed by author, 24 April 2000.

32. Joe J. Puckett, "Operational Assessment Team's Analytical Support for the Kosovo Air Campaign," *PHALANX*, September 1999.

33. Col Kevin Kenkel, OAT Chief, "Introduction to the Operational Assessment Team's Analytical Support for the Kosovo Air Campaign," *PHALANX*, September 1999.

34. Besides the integration of JWAC, another highlight for Operation Allied Force was the development and employment of the Mission Analysis Tracking and Tabulation System (MATTS). A multiuser relational database, MATTS archived the operational execution of Allied Force by compiling and correlating strike mission data from planning through execution to assessment. For the first time, analysts had a tool that combined ATO tasking information and aircrew mission report details with aim point imagery and mission assessment comments—all in a single database. The Warrior Preparation Center prototyped MATTS in the conflict's opening weeks and then employed and upgraded the software throughout the remainder of the conflict. For further details concerning MATTS, see Joe J. Puckett, operations research analyst for the WPC/Analysis Directorate, "Operational Assessment Team's Analytical Support for the Kosovo Air Campaign," *PHALANX,* September 1999.

35. Shaw; and Kenkel interview, 24 April 2000.

36. Capt Mara Dowling, USAF, Operation Allied Force OAT Chief of Data Collection and Research, interviewed by author, 28 March 2000.

37. Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 23 March 1994.

38. "Allied Force Chief Cites Success," 24 April 1999, n.p., on-line, Internet, 22 February 2000, available from http://www.defenselink.mil/news/Apr1999/n04261999_9904262.html. "We have achieved air superiority at mid to high altitudes throughout Yugoslavia. The air defense forces there are ineffective against NATO aircraft."

39. Grant, 33. The actual expense of these opportunity costs must be weighed in the context of how many assets were available and what, if anything, else these assets could be "freed" to do. For example, F-16CJs and EA-6Bs were specifically designed as SEAD

platforms. These assets were in-theater specifically to provide SEAD; and if there were enough to provide the requisite coverage, then there were no opportunity costs. Other situations and numbers of platforms yield different answers.

40. Ellis draft. As further corroboration, Grant, 34, states, "Overall, NATO did not destroy as many SAM batteries as air planners would have liked."

41. Shaw.

42. USAFE Directorate of Studies and Analysis, "Air War Over Serbia (AWOS) Fact Sheet," 31 January 2000, 6, 8.

43. Among the numerous articles addressing this issue, see "NATO Cracking Serb Army, Police Morale, Cohen Says," 12 April 1999, on-line, Internet, 22 February 2000, available from http://www.defenselink.mil/news/Apr1999/n04131999_9904132.html; and "Air Campaign Pounds Yugoslavs, Milosevic; Withers Morale," 22 April 1999, n.p., on-line, Internet, 22 February 2000, available from http://www.defenselink.mil/news/Apr1999/n04231999_9904232.html.

44. Rear Adm Thomas R. Wilson, DOD news briefing, 30 April 1999, n.p., on-line, Internet, 22 February 2000, available from http://www.defenselink.mil/news/Apr1999/t04301999_t0430asd.html.

45. Wight.

46. Dowling. Initially, there was considerable uncertainty as to whether NATO would have sufficient political will to become involved in offensive operations or whether there would be a unilateral US response. Therefore, General Clark stood up JTF-Noble Anvil around the USNAVEUR staff as a preparatory step to US-only operations. As events unfolded, NATO forces executed the vast majority of the operation while the US-only JTF structure remained in place to control assets such as the B-2 and F-117 that did not have operational control given to NATO commanders. For a detailed look at this convoluted organizational structure, see Kosovo/Operation Allied Force After-Action Report, Report to Congress, 31 January 2000, 16–21.

47. For a review of BDA's three phases, see chap. 2, note 8. Having the GAT team provide its own BDA is *not* the way the airpower employment process was intended to function. Therefore, the team had neither the numbers nor qualifications of personnel to accomplish this task. The actions taken by the Allied Force GAT team were over and above their official charter and driven by the fact they were not receiving their doctrinal support from other agencies. The GAT team is primarily responsible for developing the joint integrated prioritized target list. Additionally, they develop the daily JFACC apportionment recommendation, planning guidance, and intent, to include objectives as well as operational constraints and restraints for each ATO period. For a detailed discussion of GAT responsibilities, see Air Force Instruction 13-1 AOC vol. 3, *Operational Procedures—Aerospace Operations Center*, 1 June 1999, chap. 6.

48. Shaw; and Wight. Phase III (systemic) BDA was federated, meaning that numerous agencies participated. Usually, the agency responsible for developing the targets within a particular target set was also responsible for determining attack effectiveness against the enemy systems those sets comprised.

49. Shaw; and Wight, 21 April 2000.

50. Shaw.

51. Wight, 7 March 2000.

52. According to Wight, 8 May 2000, a number of agencies provided target nominations throughout the conflict. The US Navy nominated TLAM and some information operation targets, while the US Army nominated primarily Kosovo engagement zone targets, such as artillery and counterbattery fires. Flex target nominations came from a variety of sources including tactical reconnaissance platforms and national intelligence sources and agencies. The CAOC strategy cell internally nominated a few targets, and EUCOM/SHAPE nominated a significant number. Finally, the CIA nominated at least one.

53. Shaw.

54. Kozaryn; and AWOS Fact Sheet, 6.

55. AWOS Fact Sheet, 5. The interim fact sheet promises an expanded section on "Effects" in the more detailed AWOS One-Year Report.

56. Clinton.

57. AWOS Fact Sheet, 5.

58. Grant, 31–32, shares the comment of a Pentagon official that Milosevic's campaign was basically complete by 3 April.

59. Mueller. Additionally, as Grant, 31, relates the thoughts of US Air Force chief of staff Gen Michael E. Ryan, "[T]here was no way that airstrikes alone could halt the door-to-door killings that had been under way." Taking a less critical view, Secretary of Defense Cohen claims, "The United States and NATO achieved all goals set when the operations over Kosovo began in March." See William S. Cohen, "DoD Studies Kosovo Lessons Learned" news brief, 14 October 1999, n.p., on-line, Internet, 22 February 2000, available from http://www.defenselink.mil/news/Oct1999/n10141999_9910144.html.

60. James A. Kitfield, "Another Look at the Air War That Was," *Air Force Magazine*, December 1999, 42.

Chapter 8

Conclusions, Findings, and Implications

Those who seek to plan the future should not forget the inheritance they have received from the past.

—Sir Winston Churchill

Review

This study set out to determine how effectively the USAF has incorporated the concept of effects-based operations into its procedures for targeting and combat assessment. It began by introducing the concept of effects-based operations and a variety of taxonomies with which to consider and analyze that concept. Next, it reviewed the ideas of nine theorists and found that effects-related theory has existed at least as long as airpower theory. Following this review, the study examined how well effects-based operations were planned and executed in four case studies occurring between the early 1940s and 2000. This chapter culminates the study by looking for relevant lessons across those four military operations.

The conclusion begins with a focused comparison of the four cases to assess how well the USAF has incorporated effects-based operations into its actual combat employment. The analytical framework used within the case studies (planning, execution, assessment, feedback, and response) appears once again to facilitate the cross-study comparisons. From there, the study offers a number of additional observations concerning other effects-related lessons evident from the case studies. These conclusions and findings suggest several areas in need of improvement, and the study concludes by looking at the actions necessary to make those improvements.

Conclusions

Senior decision makers have always been interested in creating specific effects rather than simply destroying targets; however, as a whole, the USAF has been inconsistent in employing effects-based operations across the spectrum of conflict. American airpower has accomplished its most significant improvements at the tactical level of war. Though technological advances have made airpower more capable in many regards, the Air Force has focused its greatest efforts on developing more precise,

more lethal munitions that can destroy targets most reliably with the lowest risk to friendly life.

While additional advances have been made in areas besides munitions, the Air Force has not—for the most part—formally integrated these improved capabilities into its tactical operations. Where integration has occurred, it has usually been ad hoc. Consequently, the air service has failed to fully exploit the synergistic effects that operational integration of these capabilities offers. The ability to conduct effects-based operations at the strategic and grand strategic levels depends greatly on the context of the specific international situation requiring armed intervention and what senior-level personalities are in place at the time. In a similar vein, airpower's performance along the physical-systemic-psychological spectrum of effects seems to parallel its performance at the three levels of war. Airpower has become very effective at producing direct physical effects, and it is becoming increasingly capable of creating certain widespread systemic effects. Generally, though, the ability to even predict— much less generate—specific psychological effects remains yet a hope and may, in fact, act as a virtual ceiling on the potential of effects-based operations. The following sections discuss these conclusions and others in greater detail.

Planning

Much of airpower's inconsistency in employing effects-based operations was due to weaknesses in planning. First, the USAF could not control the formulation of political and strategic objectives, both of which dictated— to some extent—the focus of subsequent, supporting air operations.[1] Second, airmen were never completely free to select the targets they deemed necessary to accomplish their given objectives. Third, targeting intelligence was never perfect; and as the nature of the target moved from the physical to the systemic and psychological, available information became even more incomplete.

Objectives are the key to any effects-based operation. The earlier decision makers clearly articulated specific objectives, the more precisely subordinate commanders and staffs were able to craft supporting strategies and tasks. Additionally, the higher these objectives were stated, the more far-reaching and coherent were the supporting effects. Limited, unambiguous, political objectives that directly translated into military objectives and strategies made it significantly more likely that the United States would achieve its ultimate objectives. However, the ability to articulate these types of political objectives depended heavily not only upon the type of conflict in which the United States was involved but also upon what senior-level personalities were present at the time.

The case studies also suggested that airpower must have a unified and clearly delineated chain of command. This ensures a unity of effort focused on achieving the stated objectives in priority order. In Desert

Storm, unity of command ensured official coordination rather than hopeful cooperation. Unfortunately, the air operations over North Vietnam relied upon the latter; and, though Linebacker II was strategically effective, its tactical and operational execution suffered from the confusion caused by multiple command structures. Following Vietnam the Air Force made significant progress in unifying the command of theater airpower by creating the JFACC position. Nearly two decades later, Desert Storm clearly showed the advantages centralized control offers in terms of unifying the air effort. However, Operation Allied Force subsequently revealed that even a JFACC has difficulty overcoming the problems caused when US and allied leaders have only a vague notion of what they want to achieve and even less an idea of how to achieve it. Thus, with regard to objectives, much of the USAF's difficulties in effects-based operations can be laid at the feet of those outside and above the airpower chain of command. This problem also manifested itself in airpower target selection.

At some point in every operation, senior officials became heavily involved in selecting the targets for strategic effects. Airpower commanders were never given free reign throughout to strike the targets they deemed necessary. In the CBO, President Dwight D. Eisenhower initially decided to target the German transportation network rather than their oil system as Spaatz advocated. The JCS actually provided "strategic target" lists for Linebacker II; and following the Al Firdos incident in Desert Storm, Schwarzkopf effectively eliminated targets in downtown Baghdad as an option. In Allied Force, political leaders dominated the targeting process, precluding the targeting airmen thought necessary to achieve the desired effects. However, outside influences were not the only ways planners were limited in their efforts to exploit the potential of effects-based operations.

Even when leaders clearly stated militarily achievable objectives and allowed planners to select their own targets, choosing the right targets still required vast amounts of intelligence, not all of which was readily—if ever—available. The CBO vividly demonstrated this. It also revealed that collecting this intelligence must begin long before the actual conflict. Moreover, it taught that analysts must understand more than simply the physical layout of an enemy system. They must also appreciate how the enemy employs that system. World War II analysts failed to recognize the resilience of a robust German economy and lacked the knowledge to accurately extrapolate how attacks would affect national industrial productivity. Desert Storm planners were able to dissect the Iraqi electrical system and C^2 network but had almost no information on another primary target—Iraq's nuclear capability. Additionally, Desert Storm demonstrated how much more planners needed to know about targets and target systems in order to fully exploit the capability of precision munitions. In order to carry out the large number of near-simultaneous strikes that commenced the allied offensive, vast amounts of targeting

information had to be available, processed, and incorporated before night one. With the stealthy B-2 operational, Allied Force drove the intelligence requirement up even further by employing significantly greater numbers of precision weapons from individual aircraft, thus permitting even more targets to be struck in any given attack.

Over the course of these cases, the USAF substantially improved its intelligence, surveillance, and reconnaissance (ISR) collection capabilities. This evolution enabled planners to better identify and analyze enemy physical structures and systems, such as energy generation or industrial production. However, in virtually every case examined in this study, air-power planners failed to do any detailed analysis of the enemy himself. There was no concerted effort to study the enemy's culture or history in an attempt to understand him psychologically. This failure occurred even though psychological effects were often among the most important objectives sought. Overall, while planning for physical and some systemic effects significantly improved, planning for psychological effects remained more hope than calculation.

Execution

Over the 56-year period these cases span, the United States developed and substantially improved the ability to employ airpower to destroy known physical structures. Accuracy has improved steadily since the days of World War II when hundred-bomber formations aimed for the center of industrial complexes. The USAF introduced LGBs in Vietnam; and 20 years later, Desert Storm pilots routinely delivered improved versions through specific windows and doors of assigned targets. By the time of Operation Allied Force, further technological improvements removed weather as an inhibitor to effective targeting. Over cloud-covered Serbia, a single B-2 could deliver sixteen 2,000-pound JDAMs, with each independently destroying a prespecified aim point.

Thus, the targeting problem evolved beyond the original concern of simply trying to hit the target. In short, precision bombing evolved from rhetoric to reality. Now the issue shifted to what specific aim points to hit within a given target complex. Moreover, further technical innovations actually permitted planners to choose how to strike those specific aim points. For example, blanketing Iraqi and Serb switching stations and power lines with special carbon-fiber wires caused massive short circuits and power outages without permanent damage. Although destruction was rarely ever the ultimate objective, technology now permitted airmen to precisely apply and measure amounts and types of force. This improved capability created a flexibility that required operators to know more than the target's location alone. Unfortunately, planners frequently failed to tell operators what effects they wanted to create. This failure affected not only aim point selection, munitions choice, and weapons delivery but also other aspects of effects-based operations as well.

Assessment

A lack of timely, accurate BDA and combat assessment was consistent throughout the four cases. The ability to assess physical damage improved the most but was still not completely reliable as recently as 1999. Functional damage assessment improved less and, while the ability to assess system-level effects also improved, the procedures used to communicate requisite information to the planners needing it were no better at the end of the period than they were in the beginning. As Maj Mark G. Sopko noted, "The years that followed the Vietnam Conflict witnessed an explosion in intelligence collection technology. Damage assessment, however, was overlooked during this intelligence revolution."[2]

In order to be effective, assessors needed to understand what they were assessing. This entailed not only knowledge of the enemy and, in particular, the system or object being targeted but also the results planners sought in striking that target. Several examples indicate that, either planner intentions were not provided in the tasking or those tasked with assessing strike effects were untrained or incapable of making such assessments. For example, the 25 percent effectiveness BDA ascribed to a Desert Storm sortie––because bombing had destroyed only 25 percent of the intelligence headquarters building––ignored the effect subsequently created by personnel evacuation, which fully achieved the "functional kill" that planners intended. Likewise, this error was repeated in Allied Force when analysts appraised a target as "not destroyed" because there were still one and one-half walls standing after the strike. In short, these examples illustrate how difficult it is to assess any effects more sophisticated than simply determining how much of the physical target was destroyed.

In all of these cases, assessors relied heavily on visual photography, that, even when available, only revealed a portion of the entire picture at best and was sometimes completely misleading. Overall assessment required more than merely appraising physical damage. There is evidence of this not only in the examples above but also in the 1943 attacks on German industry. Allied 500 lb bombs heavily damaged building exteriors and this showed well in poststrike photographs, but they failed to destroy the industrial machinery inside. The result, based on the photographs, was an overly optimistic appraisal of mission success. Yet, even when analysts accurately assessed mission results, the Allies had difficulty extrapolating those results to predict systemic effects and their ultimate impact on enemy war efforts. To assess functional and systemic (not to mention psychological) effects, analysts needed a broad knowledge of the enemy that even the highest-resolution photographs did not provide. Though SIGINT filled in some of the missing information, much remained unknown and required educated guesses. When required to speculate, analysts tended to overestimate airpower's effect on industrial output. They often greatly underestimated

enemy repair capability, resourcefulness in finding work-arounds, and the flexibility of a robust economy.

As to what the information analysts really wanted could not be gleaned from photographs, piecing together the desired intelligence required more knowledge of the enemy than was often available. This was especially true of attacks designed to affect the enemy's will. Each case revealed that analysts and planners knew very little about enemy psychology, and this precluded their ability to estimate in any reliable way what effect an action, such as loss of electricity, might have on enemy will or morale. Lacking this knowledge, analysts simply defaulted to ethnocentric mirror-imaging, asking themselves: "How would I feel in this case?"

The timeliness of poststrike assessment reports was an issue from the beginning. In the CBO, every fifth or sixth bomber carried camera equipment to record its attack so that unit commanders could view strike results immediately upon landing. Eventually, commanders realized that simply viewing real-time photographs of a strike did not always equate to accurately assessing its effects. In Linebacker II, weather often precluded post-strike photography altogether, forcing planners to develop subsequent missions without knowing the results of earlier efforts. Though not always due to weather, lack of timely feedback drove Desert Storm planners to bypass national-level analysis and personally review onboard sensor film of precision strikes. As a minimum, they could determine whether the target had been struck and surmise the near-term functional effects. Though not always completely accurate, it was the best intelligence available when planners needed to decide the next move. Nearly a decade later, this scene was repeated many times in the Allied Force CAOC. Assessors and planners reviewed aircraft tapes to evaluate physical damage and amend the next ATO accordingly. It took approximately a week for other agencies to provide functional damage assessments, and some CAOC planners never saw system-level assessments throughout the 78-day conflict. These assessment times lay in stark contrast to those depicted as typical in the *BDA Reference Handbook*, which maintains that Phase I BDA reports are available within one to three hours, Phase II reports within four to six hours, and Phase III reports are provided on a daily basis.[3]

Feedback and Response

Decision makers wanted objective details and chose to infer effects from quantitative facts, regardless of appropriateness, rather than base decisions on more subjective, circumstantial evidence. Desert Storm's battlefield preparation objective of decreasing Iraqi army effectiveness by 50 percent provides the clearest example of this tendency. Because General Schwarzkopf's component staffs were unable to reach a consensus on how to measure effectiveness, he was more inclined to use the number of air strikes against a unit as his prime indicator of effectiveness rather than the damage reported from those strikes. Often

objective analysis based on numerical indices was simply not available. This forced commanders and planners to make decisions without quantifiable feedback. Achieving air superiority was often an after-the-fact assessment that commanders made once sufficient numbers of aircraft returned without being attacked. The more frequently this occurred, the more their assurance of air superiority grew. In essence, lack of enemy success defined friendly success. This inability to confidently claim air superiority without first proving it was seen in every case from Germany to Vietnam to Iraq to Serbia. Feedback on other systemic and psychological effects was even less measurable. In many cases, such feedback was simply pure optimism without any basis of evidence other than a heavily ethnocentric interpretation of what *should* have happened.

In the majority of the cases, information that gave decision makers confidence, either to continue with their plan or alter it, came not from photographic evidence of physical damage but from signals or human intelligence concerning indirect effects of airpower's destructive bombing. In some cases, SIGINT essentially provided an enemy "self assessment" on which to base combat decisions, while HUMINT offered other clues as to bombing's effects on the enemy. Among other things, the four cases saw HUMINT provide an internal look at mass evacuations, troop desertions, failing popular morale, and failure of local personnel to report for Reserve call-ups. Though the goal had been to meld all of these resources into a coherent picture of the enemy, this fusion still had not occurred––at least for air planners––as late as 1999.

Additional Findings

Often, strategic success is less the result of physical or even systemic damage than it is the way those things impact enemy decision makers psychologically. Unfortunately, the human psyche routinely defies objective examination. Multispectral imaging and analysis significantly improve our ability to measure physical damage, but the effects we often want most are psychological and cannot be photographed at any wavelength. Accordingly, the most pertinent feedback on operational and strategic effects often come from atypical measurements, such as changes in the enemy nation's gross national product, analysis of enemy manpower devoted to repair efforts, and varied enemy dependence on imports. Likewise, subjective sources such as HUMINT, analysis of internal propaganda, and enemy self-assessments collected via SIGINT also provide important feedback on operational and strategic effects. Except for the final source, none of these resources provide conclusive evidence of direct effects; rather they serve as indicators of indirect effects. Lack of access to enemy records following the last three operations further complicate our analysis of effects-based operations by precluding conclusive answers as to what specific effects friendly actions generated on past enemies. We can only surmise these causal linkages

using the facts available, and this leaves much room for subjective interpretation and disagreement. However, we should not give up because the process is difficult. While advocates have made extensive improvements in certain areas of effects-based operations, there remains room for much more.

Planners need to give assessment considerably more forethought than they have in the past. There is historical precedent to devoting significant planning time to weapons delivery. We need to apply this same attitude of forethought to the area of assessment. The USAF must dedicate the time, personnel, and equipment necessary for developing the ability to effectively conduct BDA and overall combat assessment before these skills are needed on the battlefield. Commanders must provide analysts the opportunity and the information to plan the assessment at the same level of detail as operational planners do the execution.

Specific weapons may influence the type of sensor required to record resultant effects. PGMs and nonlethal weapons increasingly create unique assessment problems. Likewise, subsequent restrikes on the same target may dictate a different type of sensor in order to distinguish between strike results. Similarly, intelligence collectors may have to focus a completely different type sensor on something other than the original target at some time after the original strike in order to measure functional effects.

Regardless of the specific type, ISR sensors are all—to some degree—limited in availability and require advance coordination and planning in order to position and configure them properly. The point is that commanders, planners, executors, and analysts must work together and think through all of these issues *before* execution. They must decide who measures what and how and who communicates the assessment to whom before operations begin. Combat assessment is not—or rather should not be—a separate, postattack activity. On the contrary, in order to be effective, it must be an integral component of the targeting, planning, and execution processes.

Implications

Contrary to the early history of aerial warfare, the immediate requirements for improving the effects-based employment of airpower lie outside the realm of technology. A 1999 RAND study asserts that, although military technology is increasingly available, technology alone does not determine military effectiveness. With inflexible command structures, inappropriate doctrine and tactics, improper training, and insufficient support, there will be "integrative deficiencies" that preclude realizing the full potential of innovation.[4] This accurately describes the USAF's current position with respect to effects-based operations. This study's conclusions and findings suggest four areas in which relatively minor

adjustments might leverage significant overall improvements in US airpower's effects-based capabilities.

Doctrine

In short, there needs to be some. The only document the author found that discusses, at any length, strategic effects as opposed to operational and tactical effects is a joint publication in draft.[5] To the author's knowledge, there is no Air Force equivalent even being written. One of the reasons behind this lack of Air Force doctrine and guidance is, no doubt, the fact that combat assessment, as a process, belongs to the joint force commander (JFC) and not the JFACC.[6] However, if airpower is targeting, targeting is intelligence, and intelligence is analyzing the effects of air operations, then where is the evidence of Air Force thought directed towards improving this analysis?[7] The level of effort directed toward improving the precise delivery of lethal munitions is obvious. We have gone from targeting the Schweinfurt ball-bearing plant to the Paul Doumer bridge in North Vietnam to the ventilation shaft of the Iraqi Air Force headquarters to the same type Serbian target through thick cloud cover. A corresponding level of effort to improve our ability to assess the effects of those deliveries is much less obvious, if it exists at all. We must review and rigorously analyze our operational heritage before we can begin the critical thinking required to synthesize effects-based doctrine. Without well-publicized doctrine that clearly articulates what airpower intends to achieve and how it will assess those achievements, practice will continue to rely upon ad hoc cooperation, and many operational and strategic decisions will continue to be made based on hope rather than analysis.

Training

An effects-based operation is less a process than a strategy-to-task mind-set. The US military must articulate this mind-set in doctrine and then teach, train, and exercise it. Only education and training can break the lineage of destruction-based targeting and avoid the trap described by Marshal Maurice Comte de Saxe, who in 1757 observed, "in default of knowing how to do what they ought, [they] are very naturally led to do what they know."[8] As this is really a top-down operation, ideally this mind-set would begin with the president, our commander in chief, and extend downward through the operational chain of command. However, more realistically, we must first inculcate it in the thoughts of each theater CINC or––as an absolute minimum––each JFACC and then downwards to every targeteer, operator, and analyst involved in employing airpower.

We need interactive training in effects-based operations for all echelons and agencies involved in airpower employment.[9] In order to be effective, assessment must occur at all levels; and specialized assessment requires

specialized training. However, effects-based operations require more than simply specialized assessment. They require a new mind-set for commanders, planners, operators, and analysts. Commanders must be able to articulate specific objectives that accurately convey their desired effects. Planners must learn to focus on these effects and avoid the historical trap of managing a target list. Operators must appreciate their commander's intent before they can most skillfully execute their assigned missions. Analysts must know what they are supposed to be analyzing before they can supply appropriate feedback.

Providing these skills requires more than academic instruction or stove-piped exercises that emphasize only one level of the process and assume all others work and will be provided as doctrinally advertised. In particular, assessment, like logistics, is often "assumed away" or "simulated" in peacetime exercises and training. This cannot continue.[10] In combat, people default to what they know, how they have been trained, and what they have done in the past. A new mind-set requires new training. Moreover, because communicating intent and getting agencies and people to cooperate is so important, Air Force, joint, and interagency training must exercise these interactive processes. We must integrate, train, and position the people, parts, and processes before the next conflict if we are to fully exploit the potential of effects-based operations.

The Air Tasking Order

The current ATO needs to become more like a mission-type order (MTO).[11] Everyone involved in planning, executing, assessing, and providing feedback must understand the plan. They must know the objectives and comprehend the tactics that planners want employed to strike targets in ways that achieve desired effects. The current ATO format fails to transmit this information to all the players who need it.

The Joint Warfighting Analysis Center

We must also change our organization to correct existing intelligence collection and analysis deficiencies. We are quite capable of measuring physical effects and, increasingly, systemic effects; but we are severely limited in our ability to collect, understand, and assess data to measure the psychological effects we seek to achieve. Before we can accurately assess this kind of information, or even prepare an initial strategy, we must appreciate the enemy and his strategic culture. Unfortunately, far too often the United States and, specifically, the US military does not. As the nationally syndicated columnist Georgie Ann Geyer wrote, "The most crucial element is still being left out of our military and foreign policy planning. This is cultural knowledge of the enemy."[12] Although we often quote Sun Tzu's mantra "Know your enemy," we rarely acquire knowledge in the detail necessary to permit

a truly effects-based operation.[13] We have greatly improved our ability to see and hear the enemy, but if we know nothing of his culture, are we not, as the Bible says, "ever seeing but never perceiving, and ever hearing but never understanding?"[14]

An expanded JWAC with increased emphasis on the social sciences could dramatically improve our knowledge of enemy culture and, thereby, help us determine not only what systemic and psychological effects are possible but ultimately how to achieve them. Professor Karl Mueller echoes this theme when he states,

> The complexity of coercion, like modern warfare, requires strategists and decision-makers who are expert in more than the military arts narrowly defined. In order to anticipate the effects of air attack not just on individual aim points and targets, but on the enemy's behavior, it is necessary to understand a great deal about how political systems, national economies, and armed forces function, react, and interact. Thus the strategist, if not personally an expert in politics (including warfare), economics, psychology, sociology, and organizational behavior, at least must be sufficiently conversant with the fields to recognize what he or she does not know, but needs to find out in order to make sound policy and effective strategy.[15]

The JWAC is already organized to perform effects-based analysis on infrastructure networks. Additionally, the organization has recognized ties with combatant commands, functional components, the Joint Staff, the Defense Intelligence Agency, and the National Security Agency. It also maintains liaison with the senior service schools, joint and service doctrine centers, and DOD policy research centers.[16] With these connections and established infrastructure, the JWAC is the ideal organization to plan and assess efforts to create psychological effects. However, taking on this role requires adding other academic disciplines and regional expertise.

The vast majority of JWAC analysts and planners are physical scientists and engineers; few are social scientists.[17] This staff performs objective, material-based systems analysis focused on generating and assessing physical and systemic effects. Because the JWAC does not perform behavioral analysis, it is unable to advise war fighters on what targets might create the most beneficial psychological effects. Gaining this ability requires adding behavioral experts such as political scientists, psychologists, social scientists, and individuals specializing in regional studies and cultures. Importantly, because of the diversity of the world's populace and the uncertainty of the specific location of future conflict, these regional experts would not necessarily need to be permanent members of the JWAC staff. On the contrary, the center could arrange to have regional expertise "on call" for consultation when military conflicts do flare up.

This "expanded JWAC," working in conjunction with operational staffs and the intelligence community, would substantially improve our ability to analyze adversaries in a truly holistic manner. This analysis, in turn, would help airpower professionals develop and execute more coherent

strategies for influencing adversary thought and behavior. That, in turn, would enable the United States to achieve its national objectives more effectively.

We Must Act Now

Twenty-first century war will be a "come as you are" affair. Therefore, any capability we intend to employ in wartime must be developed and exercised now in peacetime.[18] Prior to Desert Storm, USCENTCOM planners tested OPLAN 1002-90 in a three-phase command post exercise in July 1990. Exercise Internal Look 90 identified significant logistical and operational shortfalls in the military's current war plan for the Persian Gulf.[19] We must apply this same learning tool of peacetime exercise and evaluation to all aspects of effects-based operations in order to identify shortfalls while there is still ample time to correct them. If we wait until we actually need these capabilities, it will be too late. As Bertolt Brecht sagely noted, "The house will be built with the bricks that are there."

Summary

Effects-based operations are most effective as a top-down process. The higher up it begins the more far-reaching its supporting effects can be. Ideally, these operations begin with the president providing clear, coherent national objectives against which those decision makers wielding the various instruments of national power adopt supporting or supported roles as appropriate. The armed services each contribute specialized capabilities as required to generate predetermined effects and achieve specific objectives. Interestingly, many strategic and grand strategic effects generated by the use of one instrument of power require assessment by another. This is especially true of effects generated through the use of military force. This relationship necessarily entails increased communication, cooperation, and coordination not only between the services but with and between other federal departments and agencies as well.

Due to the fog of real-world operations, complete and perfect intelligence will never exist. Even if perfect knowledge of the physical battlespace did exist, many of the most sought-after effects reside only in the enemy's mind and will never be fully known. We must be ever cognizant that the logical beauty of effects-based theory tends to mask its practical limitations at the higher levels of war. Still, the continuing challenge is to improve our ability to measure and assess those things that are important and not simply dub important those things easily measured.

Mao Tse-tung said, "The only way to study the laws governing a war situation as a whole is to do some hard thinking."[20] Effects-based operations are extremely complex. Unless we "do some hard thinking" about past

performance and specific future foes, the concept of effects-based operations is likely to remain just that—another concept to be tossed into the airpower zealots' bin of empty promises.

Notes

1. Nor should the military preside over civilian policy makers. This section does not argue for change but rather simply acknowledges the practical limitations of our chosen form of government.

2. Maj Mark G. Sopko, *Analyzing the Results of an Air Campaign,* n.d., n.p., on-line, Internet, 8 April 2000, available from http://www.airpower.maxwell.af.mil/airchronicles/cc/sopko.html.

3. See Defense Intelligence Reference Document DI-2820-2-99, *BDA Reference Handbook*, on-line Internet, 7 April 2000, available from http://dia.ic.gov/intel/oicc/twj/twj4/bda/DI-2820-2_sec1.html. Admittedly, this is a draft copy of an update, but it is a final draft in which the "typical" report timing agrees with that contained in JP 2-01.1. Regardless, it is apparent that we are far from having the capability to do, in practice, what we proclaim as typical in doctrine.

4. J. A. Isaacson, C. Layne, and J. Arquilla, *Predicting Military Innovation* (Santa Monica, Calif.: RAND, 1999), vii, 1, 7. A similar discussion of what is required for innovation is found in Williamson Murray and Allen R. Millett, eds., *Military Innovation in the Interwar Period* (Cambridge: Cambridge University Press, 1996), 268, 305.

5. Second draft of JP 3-60, *Doctrine for Joint Targeting,* n.d., n.p., on-line Internet, 8 April 2000, available from http://www.dtic.mil/doctrine/jel/ddrraafftt_ pubs/3_60sd.pdf, VII-1–VII-3.

6. Air Force Pamphlet (AFP) 14-210, *An Introduction to Air Force Targeting,* 23 June 1989, 70.

7. Col Phillip S. Meilinger, *10 Propositions Regarding Air Power* (Air Force History and Museums Program, 1995), 4, 20. It is repeated again in Lt Gen Buster C. Glosson, "Impact of Precision Weapons on Air Combat Operations," *Aerospace Power Journal* 7, no. 2 (Summer 1993): 4–10. Or for the official repetition, see AFP 200-17, *An Introduction to Air Force Targeting,* 23 June 1989.

8. Maurice Comte de Saxe, *Mes Rêveries; or, Memoirs Upon the Art of War* [1757] (Westport, Conn.: Greenwood Press, 1971), 162.

9. This may be problematic as, according to Commander of Air Combat Command Gen John P. Jumper, the USAF has difficulties preparing its senior officers for combat. "[T]he Air Force does a poor job of training its top leaders . . . Most of those in the Air Force leadership trained ourselves, because our system did not train us." See John A. Tirpak, "Kosovo Retrospective," *Air Force Magazine*, April 2000, vol. 83, no. 4, 30.

10. William Murray and Allen R. Millet, *Military Innovation in the Interwar Period* (Cambridge: Cambridge University Press, 1996), 325, "the 'muddy boots' business of exercises and realistic war games lay at the heart of effective innovation."

11. For an examination of the requisite preconditions necessary for the JFACC to employ mission-type orders, see Maj Michael E. Fischer, *Mission-Type Orders in Joint Air Operations: The Empowerment of Air Leadership* (Maxwell AFB, Ala.: Air University Press 1995).

12. Georgie Anne Geyer, "Domain of Many Challenges," *Washington Times*, 26 April 1997, D-10. Robert Steele echoes her thoughts with "the US defense and intelligence communities rush to spend billions on technology, while routinely ignoring the challenges and opportunities inherent in human collection, open-source collection, foreign area expertise, and human all-source analysis. . . . [T]he United States continues to give short shrift to the critical intelligence challenges associated with sociological and ideo-cultural intelligence; [and] demographic intelligence . . ." Robert D. Steele, "Information Peacekeeping:

The Purest Form of War," in *Challenging the United States Symmetrically and Asymmetrically: Can America be Defeated?* Lloyd J. Matthews, ed. (Carlisle Barracks, Pa.: US Army War College Strategic Studies Institute, 1998), 144.

13. For significantly more detail on this subject see Wray R. Johnson, "War, Culture, and the Interpretation of History: The Vietnam War Reconsidered," *Small Wars and Insurgencies* 9, no. 2 (Autumn 1998): 83–113; and Forrest Morgan, "Compellence and the Strategic Culture of Imperial Japan" (PhD diss., University of Maryland – College Park, 1998).

14. Mark 4:12, *The NIV Study Bible* (Grand Rapids, Mich.: The Zondervan Corporation, 1985), 1500.

15. Karl Mueller, "Strategies of Coercion: Denial, Punishment, and the Future of Air Power," *Security Studies*, vol. 7, No. 3 (Spring 1998): 182–228.

16. JWAC home page; on-line, Internet, n.d., n.p. 7 April 2000, available from http://www.jwac.ic.gov.

17. Currently, of the 352 civilians who comprise nearly 70 percent of the JWAC staff (the military fills approximately 12 percent and agencies, detachments, and on-site contractors the remainder), 16 are described as "Other Science & Engineering." Under this "other" grouping fall the unspecified number of resident social scientist(s) along with a corresponding number of experts in economics, geography, nuclear, aerospace, petroleum, and cartography. See JWAC Command Brief, on-line, Internet, 7 April 2000, available at http://www.jwac.ic.gov/information/CmdBrief/sld014.htm.

18. Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca, N.Y.: Cornell University Press, 1991), 38. Rosen states that "wartime innovation will be limited in its impact where it does occur at all, because the time necessary . . . is likely to be too long relative to the length of the war."

19. See *GWAPS*, vol. 1, "Planning," 41–54, for specific details.

20. Mao Tse-tung, *Six Essays on Military Affairs* (Peking: Foreign Languages Press, 1972), trans. from the *Selected Works of Mao Tse Tung* (People's Publishing House, Peking).